A Text-book of Simple Nursing Procedure for High Schools

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By AMY ELIZABETH POPE

ESSENTIALS OF DIETETICS

A QUIZ BOOK FOR NURSES

ANATOMY AND PHYSIOLOGY FOR NURSES

A MEDICAL DICTIONARY FOR NURSES

PHYSICS AND CHEMISTRY FOR NURSES

PRACTICAL NURSING
(WITH ANNA CAROLINE MAXWELL)

DIETARY COMPUTER

MANUAL OF NURSING PROCEDURE

ASISTENCIA PRACTICA DE ENFORMOS
(Spanish Edition of Practical Nursing)
CON LA COOPERACION DE ANNA CAROLINE MAXWELL

A TEXTBOOK OF SIMPLE NURSING PROCEDURE
FOR USE IN HIGH SCHOOLS

A Textbook of Simple Nursing Procedure

For Use in High Schools

Together with Instructions for First Aid in Emergencies

By

Amy E. Pope

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Illustrated

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PREFACE

Every woman should have some knowledge of the methods used in caring for the sick and of the first-aid treatment required in common emergencies and, if these essentials are not taught in the schools, the great majority of women will never know them.

Many people say, "I do not believe in so much talk about health, it was not considered necessary when I was young," and so forth, but it is to be appreciated that one third of the seemingly healthy men who applied for military duty during the last war (*who were reared under the present régime*) were turned down because of physical disability, and a most deplorable condition among school children is indicated by the following statistics, recently collected from official sources and made public by Dr. Wood:

"At least 1 per cent.—200,000—of the 20,000,000 school children in the United States, are mentally defective.

"Over 1 per cent.—250,000 at least—of the children are handicapped by organic heart disease.

"At least 5 per cent.—1,000,000—have now or have had tuberculosis.

"Five per cent. — 1,000,000 — have defective

hearing which when unrecognized, gives them the undeserved reputation of being mentally defective.

"Twenty-five per cent. have defective eyes.

"About 25 per cent.—5,000,000—are suffering from malnutrition.

"From 15 to 25 per cent.—3,000,000 to 5,000,000—have adenoids or glandular defects.

"From 10 to 20 per cent. have weak foot arches, weak spines, or other joint defects.

"From 50 to 75 per cent. have defective teeth."

To summarize, 75 per cent.—15,000,000—of the 20,000,000 children in the schools of the United States have physical defects which are potentially or actually detrimental to health.

Undoubtedly, a large number of these defects are the result of lack of hygienic living and many of them could be rectified if parents appreciated the seriousness of the conditions sufficiently to seek medical advice and knew enough about the simpler treatments and nursing methods to enable them to carry out a physician's or nurse's instructions correctly.

It is chiefly treatments and nursing care that are described in this book and, in compiling it, the author has selected procedures of which knowledge is particularly essential for young girls who may have to help care for their sick. With a few exceptions the procedures can be taught in the classroom and only methods that can be used by the inexperienced are included. But, though the

descriptions are arranged to facilitate classroom teaching, details of procedures that cannot well be carried out in public but are likely to be necessary in the care of a sick person, are also included.

AMY ELIZABETH POPE.

Suggestions for Methods of Teaching

The teacher of nursing procedures is frequently confronted with two opposing pedagogic requirements, namely: (1) To encourage the students' ingenuity and their ability to follow written and verbal instruction; (2) Not to allow the pupils to become confused between right and wrong methods by seeing procedures wrongly performed. Probably this has to be more frequently guarded against in teaching nursing procedures than almost any other variety of technical work because errors in technique may in some instances be followed by disastrous results. For this reason, and also to save time, it is frequently necessary for the instructor to demonstrate the procedures before the pupils attempt to carry them out. It is for this reason that the descriptions of methods have been entitled demonstrations. However, the descriptions are given in such a manner that the pupils should be able to carry out some of the simpler procedures without being shown how to do so and to follow the directions when practicing in their homes.

Even when the procedures are to be demonstrated, the author would advise that the pupils be required to read the description of the demon-

stration and related matter in preparation for class, since they will then be better prepared to understand and remember what they are shown. Also, it is well to allot a portion of each class time for a quiz.

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A Textbook of
Simple Nursing Procedure
For Use in High Schools

A Text-Book of Methods of Nursing

EQUIPMENT FOR DEMONSTRATION ROOM

If possible the room in which nursing procedures are demonstrated should be furnished as a bedroom and there should be a sufficiently large cupboard in it to hold the articles other than the furniture required for the demonstrations. If it is not practicable to have all the furnishings of a bedroom there should be at least: A bed, see page 8; a screen; 2 tables, one of which should be a small one to stand at the bedside and the other a fairly large one on which to place the equipments required for a day's demonstration; it is also well if possible to have an adjustable invalid's table; 2 chairs, one of which should be suitable for Demonstration 6 and the other for Demonstration 7, see Figs. 15 and 22.

Bedding: 1 mattress, 5 pillows, 6 sheets, 6 pillow cases, 2 bed blankets, 1 colored blanket and 1 cotton bath blanket, 2 spreads, a bed pad large enough to cover the mattress, a piece of rubber sheeting about 1 yard wide and 1½ yards long.

As far as possible the bedding should correspond with the description given on page 9.

Two nightgowns, a kimono or wrapper, and a shoulder wrap.

Two or 3 bath towels and about 6 hand towels and washcloths.

Toilet articles including: A toilet basin and pitcher, toothbrush and holder, glass, a small bowl, soap and nailbrush in appropriate dishes, orange stick, scissors, and nail file.

A fountain syringe bag, or else an irrigator with tubing attached.

A rubber air-ring, if possible.

An ear bulb syringe, a return flow aural tip and an atomizer.

A hot-water bag and quart bottles with corks to be used as substitutes.

An ice-cap and a pick and mallet for breaking ice.

A bedpan and cover. If the pan is not provided with a cover one can be made of heavy washable material or double-faced rubber sheeting.

Sputum cups, both porcelain or enamel and paper varieties.

A bath thermometer, an atmospheric thermometer and clinical thermometers, if possible one for each pupil, a tall glass to hold a disinfectant for the thermometers.

A foot-tub or baby's bath.

Scales for weighing baby.

Two enamel trays, one about 14 by 20 inches and the other about 6 by 9 inches.

A croup kettle or a substitute as described, page 151.

An electric or gas stove.

A flatiron.

An asbestos mat.

A saucepan with a capacity of about 1 quart.

An agate basin with a capacity of at least 1 quart.

A measuring cup, teaspoon, tablespoon, knife, and spatula.

Two wooden boxes arranged as described on page 78, and, if possible, a bed-cradle, back-rest, and Meirinecke non-slipping knee and thigh support.

A first aid box[1] containing: Small packages of sterile gauze and absorbent cotton, adhesive plaster, bandages, a pair of scissors and a pair of forceps and a small deep dish to sterilize these in (a deep agate soap dish will answer), a small bowl; a medicine glass, a small nailbrush, orange sticks, some small pieces of soft, clean muslin, boric acid powder, small bottles containing a 3 per cent. dilution of tincture of iodine,[2] denatured alcohol,[3] liquid green soap, lysol or other disinfectant. A bundle of wooden tongue depressors.

[1] Either a metal box or a wooden one lined with wax paper will be the best. The box should be locked.

[2] The official tincture of iodine is 7 per cent., but this is irritant, especially for children, and a 3 per cent. solution is an adequate disinfectant for the skin. The dilution should be done by the druggist as pure alcohol must be used.

[3] Alcohol to which a poison is added that renders it unfit for drinking but does not interfere with its value for external use.

Red Cross emergency charts.

A small bandage roller if possible.

Bandages, 2½ and 3 inches wide, about 3 for each pupil, or the material to make the bandages.

A ball of heavy white twine.

Paper bags of different sizes and a number of newspapers.

Pieces of old muslin, cheesecloth, flannel and flannelet.

Mustard, flour, linseed, and antiphlogistine.

Cleaning utensils, including: Dusters of cheesecloth and suitable pieces of old muslin; dustless dusters; an o'cedar mop; a broom, whisk, dustpan, if possible a carpet sweeper and vacuum cleaner; a small scrubbing brush, a twig sink brush and a jar in which it can be kept, a small agate pail, a can of bon ami, soap and a dish to keep it in.

A board about 9 inches wide and as long as the width of the window in the classroom as shown in Fig. 2, on page 21.

A large and a small demonstration doll.

Baby's clothes.

Feeding bottles, a basket to keep them in, and a pot large enough to hold the basket of bottles.

Nipples in a glass jar.

A brush for cleaning the bottles. For description of these articles see page 227.

A number of the articles in the foregoing list are required for only one or two demonstrations and, in some cases, demonstrations that are likely to be omitted if there is not time to have all those de-

scribed in this volume. However, on the first page of each chapter there will be found either a list of the equipment required for the demonstrations described in the Chapter or else the number of the pages on which the lists are given. Thus it will be an easy matter for those choosing classroom equipments to eliminate unnecessary articles.

CHAPTER I

Care of the Sick-Room and of Utensils Commonly Employed in the Treatment of the Sick

Articles required for Demonstration I. Ideal location and characteristics of a sick-room. Suitable furnishings for a sick-room. The natural phenomena upon which ventilation and the purification of the air depend. The reasons for the unpleasant effects experienced when in a poorly ventilated room. Some methods of ventilation. Why cleanliness is necessary to prevent the transmission of disease and the ways in which some of the more common communicable diseases are transmitted. Important rules to observe when sweeping and dusting. Methods of cleaning and disinfecting utensils commonly used in the care of the sick. Demonstration I.

Equipment for Demonstration I[1]:

The entire equipment should be on view. The articles especially required are:

The window board.

Cleaning utensils.

Articles that need special attention when they are cleaned, as the bedpan, hot-water bag, ice-cap, and rubber tubing.

The procedure of this demonstration is to consist

[1] The furniture mentioned on page I, is not listed with the equipment for the demonstrations because it is supposed to be always present.

of an exposition of methods of ventilation, sweeping and dusting, and cleaning utensils.

Desirable Characteristics of a Sick-Room and its Furnishings

A room in which a sick person is confined should be quiet, bright, and as attractive as possible. A room with a southern exposure, that has at least two windows and a hard wood paraffined floor, that is near a bathroom and removed from the noises of the street and house is the ideal.

If the patient is likely to be ill for any length of time, heavy curtains that interfere with ventilation and superfluous ornaments that make it difficult to keep the room clean should, if present, be removed, but the room must not be allowed to have a bare appearance and medicine bottles and utensils suggestive of illness are to be kept out of sight, out of the room if possible. Growing plants are valuable ornaments in a sick-room because they not only help to make it look pretty and bright, but, as explained later, during the daytime, they give off oxygen and absorb carbon dioxid and thus they help to keep the air in the room pure. In steam-heated rooms water flowers growing in open bowls are particularly good, because, as the water evaporates, it helps to prevent the air becoming too dry.

It is not advisable to use expensive bedspreads, blankets, and the like on the bed of a very sick

patient, nor to have a valuable rug or table near the bed, especially if the patient is receiving much treatment, because, under such circumstances there are many chances of accidents, even if those caring for the patient are particularly careful.

A suitable bed and bedding are of great importance to a patient's comfort. **The ideal bed** is one with an iron frame (which is easily kept clean) and a good wire spring, that is about twenty-four inches high, thirty-six inches wide and, for an adult, a little over six feet in length. If the bed is much lower than twenty-four inches it makes it difficult to move the patient easily. Of course when the patient is able to move without much assistance and the illness is of a transitory nature, this may not be of much importance, but, when the patient is suffering from a chronic disease and requires considerable assistance, the height of the bed is of so much importance for the comfort both of the patient and those caring for her that, if a bed about the required height cannot be obtained, it is well to get four wooden blocks of sufficient size to raise the bed to the required height; in the center of each block, there should be a hole about two inches deep into which the legs of the bed will fit.

Fig. 1. Ideal bed for an invalid's use. The back-rest can be lowered and raised as desired.

The mattress should be about two inches shorter than the bed. Hair, Ostermoor felt, and silk floss are generally considered to be the best fillings for mattresses. Even mattresses with cheaper fillings than these are expensive and, therefore, the mattress should be covered with a protector. The most comfortable kind of a **protector** is a quilted pad, such as is used to protect the mattress in a baby's crib, but, if the patient has to use the bed-pan and is at all helpless, it is advisable to have a rubber protector also. In emergency pieces of old blanket or newspapers sewn to a muslin foundation can be substituted. **The sheets** should be about a yard longer and a yard wider than the mattress. **The spread** should be of light weight material for the weight of those of heavy material is quite out of proportion to the degree of warmth which they provide.

The location of the bed is often of importance. The points to be considered being: (1) That it is far enough away from the walls to make it unnecessary to move it when making the bed or when doing anything for the patient; (2) that it is in the right position with regard to the window. What the right position will be depends somewhat upon the patient's condition, a person who is not very ill is likely to want to look out of the window, but, if the patient is very ill, the points to be considered are: (1) To have the bed where it will not be in a draft —for example, between the window that will be opened for ventilation and the door; (2) where the

light will not shine in the patient's eyes. This is very important, because except in diseases that affect the eyes or the brain, or when the patient wants to rest, it is usually desirable to have as much sunlight as possible enter the sick-room, both because it helps to make it cheerful and because sunlight is an excellent disinfectant, that is, it will destroy bacteria. If the bed cannot be placed where the light will not annoy the patient a screen should be put between it and the window.

Care of the Sick-Room

Care of the sick-room involves attention to its ventilation, temperature, and cleanliness.

Ventilation

Ventilation has been defined as *the continuous introduction of pure air into a room or building, thoroughly mixing it with the contained air and the simultaneous extraction of a like quantity of impure air.*[1]

Before considering the methods of ventilation it will be well to recall: (1) The nature and composition of the air; (2) the sources of its impurities; (3) nature's methods of purifying the air; (4) the cause of winds and drafts; (5) the nature and cause of humidity; (6) the reason for the discomfort experienced in badly ventilated rooms; (7) the causes of odors in badly ventilated rooms.

[1] *Principles of Hygiene.* Bergy, W. B. Saunders Co.

Air is a colorless, odorless, transparent mixture of gaseous elements. When pure, **it consists of** approximately, nitrogen 79 parts; oxygen 20.96 parts; carbon dioxid, 0.04 parts; small amounts of other gases such as argon and ozone and a varying amount of aqueous vapor.

The impurities in the air are both gaseous and solid. **The most common gaseous impurities** are: (1) Those arising from the combustion taking place in stoves, furnaces, and the like; (2) those due to the oxidation going on in the bodies of all animals and given off through the respiratory organs; (3) those produced during the decomposition of animal and vegetable matter. Ordinarily, this gaseous matter is chiefly carbon dioxid, with possibly some sulphur and ammonia compounds, and unless present in excess it is not injurious to health, but, in localities where there are defective sewer pipes or where there are factories or much decaying vegetable or animal matter, there may be other gases present some of which, if continuously inhaled, may cause destruction of the red corpuscles in the blood or otherwise affect the body in a manner that lessens its resistant powers to bacteria and other causes of disease.

The more common solid impurities in the air are: Sand, dust, soot, products of street refuse, micro-organisms, the pollen of plants, and where there are factories and the like there may be substances derived from material worked upon in the buildings.

In many industries the impurities, either gaseous or solids, are particularly injurious and, unless adequate protective measures are taken, may undermine the health of the workers. Impurities of this kind are known as *industrial or occupational poisons.*

The air is kept pure by rain, plant life, and the air currents known as winds and breezes.

The rain helps to purify the air by beating down the solid impurities and by absorbing the gaseous and carrying them down into the ground.

Plants help to purify the air by: (1) Taking the carbon dioxid (CO_2) and using it, with salts and water (H_2O), which they abstract from the ground, to form their substance; (2) liberating oxygen. Plants set oxygen free because the compounds of which they consist contain less oxygen than they absorb as CO^2 and H_2O and, as the chemical reactions upon which their growth depends proceed, the oxygen is set free and passes into the air. This is practically the only source of the world's supply of oxygen. The chemical reactions are activated by chlorophyl (the green coloring matter of plants) and light and they take place only in light and thus oxygen is not set free from plants in the dark.

Cut plants do not liberate oxygen; on the contrary, once they begin to fade, they absorb oxygen and give off CO_2.

The origin of winds: Heat causes all matter, including the air, to expand and cold makes matter contract. Therefore, in proportion to its bulk, hot

air is lighter than cold air and will rise, but, being expanded and lighter, it will not exert as much pressure as cold air. When the atmospheric (air) pressure in any locality is reduced in this way, air from colder regions is, as it were, pressed forward, this creates the air currents known as *winds and breezes*. The greater the differences between the temperatures of the air in different regions, the stronger will be the air currents, thus they may be so slight that they will be hardly perceived or so violent that they constitute a hurricane. Even the difference in the temperature of the air in the shade and in the direct sunlight is sufficient to maintain movement of the air.

In the natural ventilation of rooms the same forces are depended upon to change the air as out of doors. The air around the radiators, stove, or open fire becomes heated, expands, spreads through the room, especially upward, some of the colder air then comes nearer the source of heat, becomes heated, and so on. As the heated air expands it forces its way through the crevices around windows and doors and therefore the amount of air within the room is soon reduced and there is not enough to oppose the weight of the air on the outside of the windows and doors which is therefore pressed into the room. The greater the difference between the temperature out of doors and in doors, the more rapid will be the interchange of air; therefore, on a cold day, a very small opening will afford as much ventilation as a wide-open window on a hot day. If

there is much difference between the incoming air and that out of doors the movement of air may be perceived and it is then called a **draft.** A draft is particularly likely to occur when two openings are directly opposite to each other.

A fire, or even a lighted lamp, in an open fireplace affords an excellent means of ventilating a room in cold weather, because, as the air in the chimney, becomes heated, it passes upward and out, and thus there is soon a partial vacuum in the chimney and air from the room and also, to an even greater extent, from outside is pressed into it. The air from the room being warmer than that coming down the chimney, and coming first in contact with the fire, rises while most of that from outside passes into the room. If, when the fire is lighted, the air in the chimney is much colder than that in the room it, and with it the smoke, will be forced into the room. This can be prevented by, before lighting the fire, holding a piece of burning paper a little way up the chimney flue.

To summarize: Ventilation is maintained by inducing currents of air and, in natural ventilation, the currents are produced by differences in temperature, because hot air diffuses rapidly and rises while cold air falls.

In what is known as artificial ventilation the air is kept in motion by various mechanical devices, such as fans and pumps, which, as a rule, are situated in chimney-like passages that communicate with the rooms by means of ventilators.

By humidity is meant the aqueous (water) vapor in the air. **It is derived,** as the result of evaporation, from oceans, rivers, and other bodies of water, and from the moisture on the ground after rain. The evaporation is induced by heat. In other words, heat changes the liquid water to vapor and the vapor, being of a gaseous nature and lighter than air, rises and spreads through the atmosphere.

Localities in which there are no large bodies of water will have a relatively low degree of humidity, but, even in such places, there will be some water vapor for it will be driven thither by the winds. In cities, that are near large bodies of water and where the buildings are high, the humidity is likely to become excessive on hot days, because the high buildings interfere with the passage of air currents and, consequently, with the escape of the extra vapor that the heat induces. This will occur also in badly ventilated rooms in which there are several people because the perspiration, which is being constantly secreted by the sweat glands in the skin,[1] is evaporated and the vapor passes into the air. When there is a lack of air movement in a room the vapor resulting from the evaporation of sweat is not driven away from around the body

[1] Usually, at ordinary room temperatures about a quart of water is excreted through the sweat glands in twenty-four hours, but, in a hot environment, a very much larger amount will be excreted. We are not, as a rule, conscious of this excretion, because it is evaporated as soon as it flows to the surface of the skin, but we feel and see it when it becomes excessive or if its evaporation is interfered with.

and this interferes with further evaporation, because the air will only take up a certain amount of moisture.[1]

It is now believed that **the sense of discomfort that one experiences in a badly ventilated room is due** chiefly to the results of this interference with evaporation and not, as was formerly supposed, to

[1] The air will only hold definite amounts of moisture, how much depending upon the temperature; for example, a cubic foot of air will hold:

1.32	grams	of	moisture	at	20° F.
2.11	"	"	"	"	32° F.
2.84	"	"	"	"	40° F.
5.74	"	"	"	"	60° F.
10.93	"	"	"	"	80° F.
14.79	"	"	"	"	90° F.

Out of doors, even before saturation occurs if the weather becomes cooler, the vapor begins to condense. If it appears on the ground, it is called *dew;* if it condenses on dust particles, in small amounts and near the ground, it is called *mist;* if in larger amounts, *fog;* if high in the air, *cloud*. Unless a large amount of water vapor becomes condensed, the minute droplets are lighter than the air and are wafted about with the air currents, but if large amounts of moisture condense in the clouds, the particles of water become heavier than the air and fall to the earth as rain or, if the rain comes in contact with cold currents while falling, hail, or, if the atmosphere around the clouds is below freezing point, snow. When the actual amount of vapor in a given amount of air is stated in weight, as in the above table, it is termed the *absolute humidity*, but when the degree of humidity is expressed in percentage it is spoken of as the *relative humidity*, and the amount of moisture that the air will hold, *i.e.*, when the air is saturated, is called 100 per cent. The most desirable degree of humidity is between 60 and 70 per cents. If there is too little moisture in the air, evaporation of moisture from the surface of the body goes on too freely and the skin and the membranes covering the eyes and lining the nose, mouth, throat become abnormally dry.

the carbon dioxid that collects nor to the lessened mount of oxygen[1] because experiments have shown that in rooms as they are ordinarily built, there is too much interchange of air through the cracks around windows and doors to allow of the carbon dioxid reaching a poisonous concentration or of the oxygen becoming sufficiently reduced to account for the effects. Also, it has been found that if the air is kept in motion by means of a fan a greater degree of air vitiation can be borne without discomfort than when the air is still and, of course, the movement of the air drives away the humid air around the body. If the air in the room is hot, the effects of bad ventilation will be more keenly felt, because the loss of heat from the body by radiation[2] will be interfered with.

The results of the interference with evaporation are as follows: The skin becomes moist and warm, the superficial blood-vessels dilate and, consequently, a larger amount of blood flows to the skin (this is shown by its red color) and the quantity of blood in the internal organs, especially the brain, is therefore diminished. As the result of the reduc-

[1] As we breathe we take oxygen away from the air and if gas is burning or there is fire in a stove, etc., oxygen is taken to maintain the burning, because burning, or, as it is sometimes called *combustion* or, when it goes on slowly, as in the human body, *oxidation* consists in the union of oxygen with matter. When oxygen unites with compounds they are decomposed and heat is produced.

[2] Space will not permit description of radiation further than to state that it is one of the ways in which heat passes from hot matter, the term is used because what is called *heat* passes outward from the body in which it originates in straight lines or rays.

tion of the brain's blood supply a sensation of drowsiness and inability to fix the attention are experienced and, especially if one tries by voluntary effort to overcome the inattention, headache is likely to result. When the atmosphere, either in doors or out of doors, is both hot and humid the body temperature may rise to a degree that is incompatible with life. Such a condition is known as *heat prostration* and as *sun-stroke*.

The reason for the heating of the skin and the rise of body temperature is that the heat which is formed in the body by the oxidation of material derived from food is not gotten rid of when radiation and the evaporation of sweat are interfered with, for these are the two ways in which most of the heat is lost from the body. Heat is lost by evaporation of sweat because evaporation is only brought about by heat and that required is taken from the body. Heat radiates from the body in the same manner as it does from a stove or any other heated object.

As the conditions in a badly ventilated room interfere with the circulation of the blood, it can be readily appreciated that people who spend much of their time in places where the ventilation is defective are not likely to be really healthy and they become very susceptible to changes in temperature and "take cold easily."

The odor commonly perceived in a badly ventilated room is not, as is commonly supposed, due to carbon dioxid, for CO_2 is odorless. Ordinarily,

it is from the sebaceous[1] matter and perspiration on the skin and gaseous matter from the stomach and mouth. If the teeth are not in good condition, or if diseases of the digestive canal or the respiratory tract exist, substances with a very foul odor may be eliminated with the breath. Other not uncommon sources of unpleasant odors that may be present, even when there is good ventilation, are: Dirty garbage pails; improperly flushed toilets, or hoppers; defective sewers, gaspipes or stoves; and, in a sick-room, an odor that is very difficult to get rid of will arise if: (1) The bedpan is not properly covered immediately after it has been used and thoroughly cleansed as soon as it is emptied; (2) the bedclothes[2] are allowed to remain over the patient while she is having a defecation; (3) the patient is not properly cleansed after a defecation, or (4) she is not bathed sufficiently often; (5) the bedclothes are not changed when soiled.

As previously stated, gases from defective sewers, gaspipes, and furnaces may be injurious, but experiments have shown that the substances usually responsible for odor in badly ventilated rooms are not harmful. Nevertheless, if there is an un-

[1] Fatty matter secreted by the sebaceous glands in the skin. It helps to keep the skin soft and pliable. When present in excess it gives the skin a greasy appearance and that from the sebaceous glands in the scalp makes the hair oily.

[2] They should be folded down to the foot of the bed as described later and a sheet and, if necessary, a blanket kept for the purpose substituted.

pleasant odor in a room, the ventilation of the latter is to be rectified for, even if the cause of the odor is harmless, its presence indicates that less easily detected, but possibly harmful, conditions probably exist.

An important point to remember in this respect is that the olfactory nerves (those connected with the sense of smell) very quickly become accustomed to a stimulus and then cease to be affected by it, so that, after being in a room for a few minutes, one may cease to perceive an odor, even when it seemed particularly strong and obnoxious at first. For this reason, those responsible for the ventilation of a sick-room should accustom themelves to detecting an odor, if present, on first entering the room.

From what has been said, it will be realized that **to obtain good ventilation:** (1) The incoming air must be pure. (2) The air in the room must be kept as active as possible without creating a draft.[1] (3) If it is so cold out of doors that the windows cannot be opened widely it is better to lower the top sash, than to raise the bottom one, or else to have a small opening both at the top and at the bottom of the window. (4) If there are two windows in the room one should be opened at the top and the other at the bottom, so that the openings will not

[1] It is now generally believed that unless a draft is cold enough to make a person feel chilled it is not likely to have a bad effect and that more people are injured by remaining where the air is stagnant than by drafts.

be directly opposite each other nor on the same level.

In very cold weather there may be enough difference between the temperature of the incoming air and that in the room to allow of an arrangement such as is shown in Figure 2, inducing sufficient movement in the air to obtain fairly good ventilation. This illustration shows a narrow board placed beneath the lower sash; the upper edge of the lower sash is thus raised above the bottom of the upper one. This deflects the cold air, which enters between the two sashes, upward and thus it does not blow on the inmates of the room.

Fig. 2. Method of ventilating a room by raising the lower sash on a board. The arrows indicate the direction taken by the incoming air.

Even in very cold weather the sick-room should, as a rule, be thoroughly ventilated, at least twice daily by opening the windows widely. If necessary, before doing so, extra covers should be put over the patient and a screen placed between the bed and window.

The best temperature at which to keep the sick-room depends upon the patient's condition. As a rule, about 66° to 70° F. is advisable in the daytime and between 60° and 65° F. at night. Some-

times, however, especially if the patient has a high temperature, the doctor may require the room to be kept at a lower temperature.

Necessity for Cleanliness in the Sick-Room and Causes of the Transmission of Disease

After it was discovered that a large number of diseases were caused by the minute organisms known as *bacteria*, which are almost omnipresent, it was thought that the air and dust fairly teemed with disease producing germs, but it has been found that the organisms which cause disease are not nearly as prevalent as was supposed, because most of these species are readily killed by sunlight and by drying and they depend upon material that they find in the animal body for subsistence. Nevertheless, though dust may not in itself be quite the source of danger that, until recently, it was supposed to be, its presence is likely to protect and hide what is a source of danger. For example, the germs that cause many of the infectious diseases, such as tuberculosis, measles, scarlet fever, meningitis, infantile paralysis, diphtheria, influenza, some types of pneumonia and colds, are in the secretions of the nose and mouth of a patient who has any one of these diseases. Therefore, the drops that are ejected when the patient coughs may contain millions of the bacteria. As patients suffering with these diseases often have considerable trouble breathing, and are not always con-

scious of what they are doing, they are likely to cough frequently and with force and drops of sputum may go a considerable distance. Now, if the room is dirty and dusty, the lodging plane of the virus may not be perceived and, the dirt may protect the substance from air currents and light and thus retard its drying and the destruction of the germs, and, if the infected place is not well cleansed it affords a source of infection for anyone who touches it and later puts her hand to her mouth or touches food or some other object that is put in the mouth or that comes in contact with food.

The germs causing typhoid and certain types of diarrhea and some other less common diseases are present in the feces and sometimes in the urine and anything becoming soiled with these excreta will be a source of infection. With care, however, it is easier to limit the danger of infection by these organisms than by those that are contained in the mouth and nose secretions. Care implies the immediate disinfection of anything that becomes soiled with the excreta.

Flies, it is believed, form one of the most common vehicles for the transmission of infection when excreta of any kind is not properly removed and disinfected, because, when they alight on such material, their feet and wings become soiled with the virus and they carry this to whatever they alight on next, and this may be food or something that will come in contact with food. Therefore the

fly that is allowed to enter and escape from the environment of a person suffering with an infectious disease is a menace. It is said that if flies could be exterminated one of the greatest causes of the spread of disease would be eliminated.

Mosquitoes also are a menace, especially in localities where malaria and yellow fever are prevalent, because certain species, a different one for each of these diseases, will absorb the organisms causing the disease when they bite a person who has been already infected and they afterward inject them into the blood of another victim.

Thus it can be seen that the room occupied by a sick person must be kept particularly clean and it should be screened, so that flies and mosquitoes will not be able to enter and, if they do, they should be killed.

There is **another cause for the spread of communicable diseases,** knowledge of which is so important that a few words regarding it will be inserted here, though it is not especially connected with the care of the sick-room. It is that bacteria may live as parasites[1] within the body of an individual without, at least at once, making the host[2] actively ill, but, though not ill, or only very slightly so, the individual may infect towels, drinking cups, or other utensils that she uses and, if the bacteria

[1] Bacteria that cause disease are called *parasites* because they derive their sustenance from the tissues of the individual whose body they invade.

[2] Any animal or plant within or upon which another organism lives parasitically, is termed a host.

are harbored in the mouth or nose, eject the germs if she coughs or sneezes. The reasons for this are: (1) It takes some time after a person becomes infected with bacteria for the latter to multiply and induce a sufficient amount of toxin[1] to poison the individual and thereby produce the conditions and symptoms of disease. This interval between the time that the person becomes infected and the appearance of the acute symptoms of the disease is known as the *period of incubation*. (2) A person may have such a slight attack of a disease that the symptoms are not recognized and yet the bacteria given off from the body may, if they invade a person more susceptible to their influence, cause a virulent and possibly fatal infection. (3) Sometimes a person, after recovering from an infectious disease, even an unrecognized attack, becomes what is known as a *carrier*, that is, she continues to harbor the germs in her body but, because she is immune, their poisons no longer affect her.

To understand **what is meant by immune** and why some people are more susceptible to infection than others, it must be known that the body is provided with several means of protecting itself against bacteria, some of these are classed as *anti-*

[1] Bacteria, like all other living organisms, require food to maintain their life and those which cause disease in man get their food from material in the human body. In the assimilation of their food chemical substances are formed which are poisonous to human beings and are therefore termed *toxins*. The toxins produced by different species of bacteria are dissimilar and therefore they produce different symptoms.

bacterial substances, because they destroy or lessen the vitality of bacteria, and others are known as *antitoxins*, because they unite with substances usually spoken of as *toxins* formed by bacteria and thereby prevent them injuring the body cells. Some of these substances are natural constituents of the blood, others are only evolved as the result of an attack of a disease or by vaccination. The protective substances formed in the body as the result of bacterial invasion are more or less specific, that is, they can only be depended upon to protect the individual from the same species of bacteria, or their toxins, as those which caused their formation, though, it is now thought, they may possibly have some slight restraining effect upon some others. For example, if a person has had typhoid fever, she is not likely to have a second attack but the substances in her body which serve to prevent the second attack cannot be relied upon to protect her from any other disease, though, it is just possible, they may do so to a slight extent, especially diseases caused by bacteria that resemble the typhoid bacillus, which is the cause of typhoid fever.

The amount of natural, as well as acquired, protective substances in the blood varies in different individuals and even in the same individual at different times, and the former are likely to be diminished when a person is in ill health. Naturally, a person who has a relatively large amount of protective substances in her system is not as likely

to contract infectious diseases as an individual who has a smaller supply.

Important Points to be Considered and the Methods Used in Cleaning Sick-Rooms

1. It is to be remembered that scattering the dust from one place to another will not make a room clean. Therefore, when sweeping, keep the broom close to the floor. Sweeping the floor, however, is not the best way of cleaning it. Preferable methods are to take up the dust with a vacuum cleaner, or, if this cannot be obtained, and the floor is carpeted, to sweep the dust out from around the walls and the corners and then take it up with a carpet sweeper or, if a polished floor and rug are the problem, to use an o'cedar or similar mop on the floor and the carpet sweeper on the rug. If the baseboard is painted white the mop should be covered with a duster while dusting the floor near the wall because the oil on the mop is likely to discolor the white paint. As previously stated, it is well, when possible, to have a rug that is small enough to be removed without disturbing the bed or other heavy furniture and in such case, when there is no vacuum cleaner (if the patient has not an infectious disease) the rug should be taken from the room occasionally and vigorously brushed or beaten.

To avoid scattering dust while dusting, be careful not to flick the duster around and it is well to

use a moist duster on articles that will not be injured by the moisture. Those which are likely to be are: Lacquered metals and surfaces, as walls, that are colored with water paints or kalsomine; and water will dull varnished or waxed surfaces, but for these the duster can be slightly moistened with the various preparations, such as o'cedar oil, that are intended for the purpose. Only the minutest amount of oil is required and more should not be used for, if the wood is left greasy, dust will stick to it and may be hard to remove.

2. Do not use a dirty duster or dirty water for dusting and cleaning.

3. Dust higher shelves, etc., before lower ones.

4. When dusting, for example, a bed do not forget the bar and shelves that are out of sight.

5. Form the habit of removing dust with one firm stroke, it is waste of time and energy to move the duster back and forth over a surface unnecessarily, as is very commonly done.

6. Do not use alkaline soaps and cleansing powders[1] on painted surfaces and enamel bath-tubs, sinks, etc. Bon ami is good for these purposes, except for colored walls, which it is very likely to streak, because the powder is not easily removed from between the granules of plaster;

[1] Most of the laundry soaps and the cleansing powders used for cleaning tiles, cement, and unvarnished wood contain some free alkali. This increases their detergent powers and makes them valuable for these purposes, but alkali tends to dull and roughen enamel ware and glass.

neutral soaps, as ivory, and warm water are the best detergents for this purpose.

Care of Cleaning Utensils

Wash dusters after use and, when possible, hang them in the sunlight to dry. Wash brooms and brushes in soap and water when they look dirty and remove dust from brushes with a metal comb, which should be kept for the purpose. If there is no suitable place in which to shake the dust off a dusting mop, or when it has been used in the room of a patient suffering with an infectious disease, put a rubber glove or an old kid one on your hand and pick the dust off the mop, then put the soft part of the mop in a paper or thick muslin bag, tie this tightly around the handle and shake the mop. When the mop is dirty, soak it in kerosene or boil it in water and soda (about one teaspoon of soda to a quart of water). After it is dry sprinkle a small amount of o'cedar or other polishing oil over it.

Care of Sick-Room Utensils

After emptying a **bedpan** or **sputum cup**[1] rinse it with cold water until every particle of the ex-

[1] When possible paper sputum cups, which are not emptied, but burned, should be used. A patient with any of the diseases mentioned on page 22 should use paper napkins for handkerchiefs and these, when soiled should be put in a paper bag which, with its contents, should be burned.

creta has been removed and then scald it with hot water. If it is not easily cleaned use a small sink brush to rub off adherent matter. After using the brush for this purpose, do not use it for any other, but keep it for similar use in a disinfectant until all likelihood of its being again required has passed.

Rubber articles, as hot-water bags, ice-caps, and rubber tubing and syringes are easily ruined if they are not cared for properly, because rubber is rotted if it is exposed to a high temperature (as that of boiling water) for a long time; if it is put away moist, and if it is left in contact with oils, acids, and alkalies. Therefore, clean such articles carefully before putting them away and do not use alkalies, as ammonia and soda, or strong laundry soaps (which contain free alkalies) for cleaning them; use a neutral soap, as ivory. If they require to be disinfected, boil them, but not longer than five minutes and when filling a hot-water bag for use, do not use water that has a higher temperature than 180° or 190° F. Be sure that rubber articles are dry before putting them away; to dry the interior of a hot-water bag or rubber tubing hang the article where it will drain and stretch tubing occasionally; dry the interior of an ice-cap with a towel or soft muslin and let it stand for some time with the cover off. When putting on the cover of an ice-cap or inserting the stopper of a hot-water bag, leave enough air in the articles to keep their sides from sticking to each other and put them away in

boxes, for the rubber is easily punctured and even a pinhole will render them useless.

The bed linen, table covers, and the like used in the sick-room are so frequently stained that it is well to remember how to **remove the stains** that most commonly occur.

A rule that holds good for all stains is, if possible to avoid it, do not let a stain dry; if means to erase it cannot be taken at once, place the stained article in warm water and later use the special reagent for removing it.

To remove stains made with coffee and tea, soak and then wash the stained part in boiling water and soapsuds.

To remove ink stains soak the stain in warm water then cover it with lemon juice and salt and place it in the sunlight; when dried, wash it in warm water, if the stain has not been removed, repeat the procedure.

Stains made with most medicines can generally be removed by soaking the stain for some time in alcohol and then washing it with soap and hot water.

Iodine stains are most easily removed by soaking them in ammonia water and then washing the material in soap and water. Sometimes soap and water or alcohol alone will remove the stain, if it is treated as soon as it is made and the iodine is not allowed to dry.

Silver nitrate stains can be removed by covering the stain with iodine and then removing the latter as just described.

The Disinfection of Sick-Room Utensils

By disinfection is meant the destruction of bacteria. As stated in the first part of this section, anything that becomes soiled with material containing bacteria must be disinfected.

The surest way of destroying bacteria is to boil the contaminated article. If this consists of metal or of porcelain or other hard substance that bacteria cannot penetrate, five minutes boiling will be sufficient, but more time must be allowed if the bacteria are not likely to be at once exposed to the heat, as, for example, if bundles of sheets are boiled in a receptacle that is so small that the sheets are pressed together, or if the sheets are soiled with feces or sputum which are hardened by heat and may therefore protect the bacteria for a short time. When heat is used to destroy bacteria, the process is usually spoken of as *sterilization*.

For many reasons, it is sometimes impossible to make use of heat to destroy bacteria, and then chemicals, known as *disinfectants* or *germicides*, are employed. There are a number of **good disinfectants** to be had, there are also a number, widely advertised, that are practically useless, and many of those that are efficient germicides will stain linen, or corrode metal, or have other undesirable qualities which limit their usefulness.

Naturally, for home use, disinfectants that can be employed for the largest number of purposes are to be preferred. Lysol and iodine are good ones to

have in the emergency chest (this will be referred to again in the chapter describing the care of wounds) and lysol and chloride of lime are two of the best ones to have when caring for a person with an infectious disease.

Lysol is a mixture of soap and of the chemicals known as *cresols* which are similar to carbolic acid, but they are stronger germicides. Because of its soap, lysol cleans, as well as disinfects, and thus it is particularly good for the disinfection of the skin and of instruments and utensils. It can also be used for the disinfection of linen, excreta, and toilets, but for the two purposes last mentioned cheaper disinfectants, such as chloride of lime, will answer equally well.

For the disinfection of the skin, utensils, and linen, a 1 per cent. solution of lysol is generally used, that is, 2½ teaspoonfuls (approximately 10 c.c.) of the concentrated lysol is used to make 1 quart (approximately 1000 c. c.); warm water is used as the diluent. For the disinfection of utensils, the solution is generally prepared once a day in a pail and, after a used utensil has been cleaned, it is put into the solution and left for about an hour or until it is needed again, when it is dried with a towel kept for the purpose. A solution for disinfecting the hands is usually prepared in a toilet basin and kept where it can be conveniently reached, for the hands should be well rubbed with it after doing anything for the patient. Unless it becomes soiled, the same solution can be used

repeatedly, but a fresh supply should be prepared at least once, and usually twice, daily. For the disinfection of feces and sputum, enough of the concentrated lysol is used to make the mass about 4 per cent., that is, if there seems to be about one cup full of excreta (approximately 250 c. c.) about 2½ teaspoonfuls (10 c.c.) of lysol is used. Enough lysol to make urine 1 per cent. is generally sufficient, as it comes more readily in contact with the bacteria. After the addition of the lysol, the excreta should be allowed to stand for fifteen to twenty minutes before being emptied. Lysol, however, is not as good a disinfectant for excreta as chloride of lime.

Chloride of lime (bleaching powder), in the same percentages as lysol, is about the best disinfectant for excreta, toilets, and privy vaults. It can also be used in a 1 per cent. solution for the disinfection of linen, but the latter must be well washed in several waters after removal from the disinfectant or it may be destroyed.

Unslaked lime is a cheap and efficient disinfectant for excreta that is to be emptied into a privy vault and for the vault, but it has to be used with caution for, if it comes in contact with the flesh, it is likely to cause severe burns and it will destroy linen and corrode metal. The chemical reaction that occurs when the lime is added to excreta is attended with the evolution of such intense heat that disinfection occurs very quickly.

Chlorine and lime disinfectants must be kept

tightly covered, or their efficiency will be reduced.

Some important rules to remember in connection with disinfection:

1. Only use disinfectants that are recommended by competent authorities.

2. Always use the full amount of disinfectant that you are told to and let the article remain in the disinfectant the time advised.

3. Be sure that the disinfectant can penetrate contaminated material, if this is of a nature to be penetrated by bacteria, for *disinfectants have to come in actual contact with bacteria in order to destroy them.* For example, if a typhoid patient passes hard masses of feces and the disinfectant is merely poured over the mass, millions of bacteria may remain alive and active in the interior. Therèfore, hard masses of feces should be broken. The disinfection of excreta emptied into privy vaults is particularly important, because, when in the excrement, the bacteria have the material they need for their sustenance and will multiply enormously, and the ground water percolating through the soil may wash bacteria into the wells, streams, etc., in the neighborhood. Several epidemics of typhoid have been traced to this source.

4. Disinfectants are poisonous to human beings, some of them extremely so and, therefore, bottles containing them should always be clearly labeled and kept in a locked receptacle.

5. Proper disinfection of the hands is extremely important and, as they cannot be kept in the dis-

infectant long enough to insure the destruction of the bacteria, they must be well rubbed and scrubbed. Also, to prevent the contamination of the hands as much as possible, rubber gloves should be worn when cleaning infected utensils and the like. Cold cream or other lubricant should be used freely to prevent the hands being roughened by the disinfectant and frequent scrubbing, and the nails should be kept short—long nails and roughened skin hinder disinfection.

6. Whenever possible infected bed linen and the like should be boiled, rather than disinfected. The linen can be put into a pail when it is removed from the bed and covered with water, and the boiling done when convenient.

CHAPTER II

Methods of Moving, Lifting, and Carrying Patients[1]

Important points to remember when moving, lifting, and carrying people. Demonstration 2: How to: Raise a patient's head; turn a patient on her side; draw her to the side of the bed; move her up in bed; raise her to a sitting position; lift her from the bed; carry her.

Equipment for demonstration:

A bed with the ordinary bedding, the upper covers folded back to the foot of the bed.

A subject: It will probably be advisable to have a small child act as subject for the last procedure—carrying the patient—but the pupils should

[1] To the Teacher: The procedures of this lesson have been arranged separately, instead of, according to the usual custom, in connection with bed-making in order (1) that the pupils may appreciate that they are to be carried out whenever a helpless person is moved, and not only when making the bed; (2) to afford a means of drill and of focusing the pupils' attention upon what are often the most important and difficult procedures in the care of a sick person and, though few of the pupils of a high school are likely to be called upon to care for a helpless patient, if they study nursing procedures at all they should learn to do work of this kind well, if only because such ability will do much to remove the fear of doing anything for a sick person which so many people have, and which makes it so difficult for a nurse to get members of a patient's family to help her when she needs assistance.

take turns being "the patient" for the other procedures of this lesson, because experiencing the sensations produced helps them to appreciate how the movements should be made.

Points to be considered in moving a patient:

1. When a patient is very ill, especially when her heart action is rapid or weak, moving must be done without her assistance.

2. It is often important that a patient be moved as little as possible.

3. Do not attempt to move a patient until you are sure that there is nothing (*e.g.*, bedcovers) to hamper her movements.

4. When two or more persons are moving a patient, they must work in unison, and in order to do so one must take the lead and give necessary directions and the word to move when all is ready.

5. When necessary to lean forward while moving or lifting a patient, bend from your hips and keep your shoulders thrown back.

6. When necessary to lift a patient's thighs, as when passing a sheet under her, except when she is very weak or has some injury of the legs, flex her knees, and have the soles of her feet flat upon the bed. When in this position a patient can usually help to raise herself and, even if she is unable to do so, it is easier to lift her if her thighs are raised from the bed as they are when her knees are flexed.

7. When lifting a patient's shoulders, support her head. To do this, bend your elbow slightly, pass your arm behind the patient, place your hand

firmly under her far shoulder and your fingers in the axilla, let her head rest in the bend of your elbow, see Fig. 3. When passing your arm behind the patient raise her head with your free hand.

Fig. 3. Method of supporting head and shoulders while adjusting pillows, etc.

Important points to consider when lifting and carrying a patient are:

1. Before lifting a patient from the bed draw her to the edge in order to minimize the necessary degree of stooping.

2. When stooping is unavoidable, bend the knees and hips and keep the shoulders thrown back; *do not bend the back, especially when you have a weight on your arms.*

3. When lifting or carrying a patient do not let her put her arms around your neck, but have her put them across your chest and back (under your arm nearest her) and clasp her hands on your far

shoulder. More weight is thus thrown on your shoulder, and less upon your back; the shoulders are not easily strained by a weight and the back is.

4. Before lifting a conscious patient, tell her to hold herself as stiffly as possible while you are lifting and carrying her.

5. If a patient is to be carried, before lifting her, see that there is no obstruction between you and your goal.

6. When two or more persons are carrying a patient in their arms they should step in unison, but not with the same foot; *i.e.*, when one steps with the right foot her neighbor should step with the left.

Demonstration 2

Moving, Lifting, and Carrying a Patient

To turn a patient on her side: *By methods 1, 2, and 3 the patient is turned with her face toward the person moving her, by method 4 she is turned with her back to the mover.*

Method 1. *If the patient is not helpless* all that is usually necessary is to place one hand on her back between the shoulders and the other behind her thighs. Pass your hands behind her on the side farthest from you and press upward.

Method 2. *To turn a weak or helpless patient,* slip one arm under her far shoulder and obliquely across her back, so that your hand comes under the

side nearest you; pass your other arm under her hips, also from the far side, raise her slightly, and, drawing her somewhat backward, turn her toward you. (See Fig. 4.) It may be necessary to make

Fig. 4. Turning a patient.

some change in the position of her shoulders or hips. If so, to move her shoulders, place your arms, one on either side, around her body with your hands under her lower arm, raise her slightly, and move her as required. Have the pillow under her head while doing this. The hips can be moved in the same manner.

Method 3. *To turn a heavy patient* loosen the draw sheet[1] on one side and, reaching over the patient, grasp the loosened end of the sheet on a line with the patient's shoulders and thighs and, by pulling it toward you, turn the patient.

[1] See foot note page 47.

Method 4. Slip one arm under the patient's shoulders from the near side, getting your hand as far as possible under her far side. Pass your other arm under the hips until your hand comes well under the far thigh. Raise her somewhat and, drawing her slightly backward, turn her.

To move a helpless patient to one side of the bed: If alone and *the patient is small*, pass one arm under the upper part of her back and the other under her thighs and draw her toward you.

If the patient is tall, put one arm back of her neck and far shoulder and the other under the small of her back and move the upper part of the body; then slip one arm under the small of the back and the other under the knees and move the lower portion of the body. It may be necessary to repeat the procedures once or twice in order to get the patient as far over as required, but it is not essential to carry them out in the same order; in fact, it is better to move first the part of the body by which you are standing.

If the patient is very ill and heavy, assistance should be had. In such case, support the patient's head and shoulders with one arm and slip the other arm under the small of her back. Have your assistant stand beside you and pass one arm under the upper part of the patient's thighs and the other under her knees. Draw the patient toward you.

To move a patient up in bed:

Method 1. Flex the patient's knees so that her feet will rest firmly on the bed. Pass one of your

arms behind her and, supporting her head in the bend of your elbow, grasp her under her far arm. Put your other arm under her thighs.

If the bed is supplied with a *pulley*, have the patient grasp this; if it is not, have her place her hands, palms downward, firmly on the bed and, in either case, have her raise herself slightly while you draw her upward.

Method 2. If the patient is heavy and cannot help herself it will require two people to move her and, unless the bed is a wide one, it is better to stand on opposite sides.

If possible, flex the patient's knees, even though she cannot help herself; grasp her under the far arm as when lifting her alone and place your other arm under her back. Have your assistant place one of her arms near yours and the other under the patient's thighs or, if the latter's knees are not flexed, under them.

Method 3. Loosen the draw sheet and roll this to the patient's side. Take hold of the roll on a line with her shoulders and thighs; have an assistant do likewise on the other side, taking hold of the roll directly opposite you. Move the stretcher thus made, and with it the patient, upward.

To raise a patient into a sitting position: Pass your arm nearest the head of the bed behind her as in Fig. 3, if necessary and possible, have the patient place her hands palms downward on the bed and, by pressing upon them, help lift herself as you raise her into a sitting position.

To carry a patient on a chair made with the hands: If the patient is in bed, draw her to the edge, and then raise and turn her so that she will sit with her legs over the side.

Grasp your left wrist with your right hand and have your assistant clasp her left wrist in like manner.

Fig. 5. Carrying a patient.

Both pass your hands under the patient's thighs and each clasp the other's right wrist with her left hand. Have the patient place one hand on your far shoulder and the other on your assistant's. Raise her and walk to your destination.

To carry a patient as shown in Fig. 5: If the

patient is in bed, pass your arm diagonally across her back, placing, if possible, your hand in her axilla. Pass your other arm under her knees.

Have the patient clasp her hands on your shoulder, putting her arms across your back and chest, *never around your neck* because this throws more weight upon your back.

CHAPTER III

Bed-Making

Important points to be considered when stripping and making a bed. Demonstration 3: Stripping a bed and making a *closed bed.* Demonstration 4: Making a bed with the patient in it, including changing the nightgown and turning the pillows.

Equipment for Demonstration 3:

A bed. Small table. Two chairs. Two pillows and their covers. Mattress and mattress protector. Rubber sheet or quilted pad. Three sheets and two blankets.

Demonstration 3

Stripping a Bed, Making a Closed Bed. Stripping and Airing a Bed

The important points to be considered are: To save time and energy by doing the work in an order that will entail going around the bed as seldom as possible.

Not to soil the clothes by dragging them on the floor.

To so arrange the clothes after they have been removed from the bed that they will be all exposed to the air.

Procedure: Place two chairs back to back two feet apart.

Place the pillows upon the table or the seats of the chairs.

Fold the spread in its creases and hang it where it will not get crushed.

Loosen the clothes all around the bed. To do this raise the edges of the mattress by passing one hand along under it, and draw out the clothes with the other hand.

Remove the clothes, one at a time, taking hold of each article in the center (this will prevent their ends dragging on the floor), and place them over the back of the chairs. Hang the rubber sheet over a bar of the bed.

Turn the mattress over from top to bottom[1] and stand it, arched, on its upper and lower ends. The bed should air for at least twenty minutes.

Making a Closed Bed

Points to be remembered when making a bed that is to be occupied by a sick person are:

1. Protect *the mattress.* A quilted pad, put on under the under sheet,[2] will be sufficient protec-

[1] The mattress should not be turned from side to side, for, if it is, the same part will again bear the heaviest weight of the patient and the mattress will become dented sooner than it will if properly cared for.

[2] The sheets are usually spoken of as the under sheet, the draw sheet, and the upper sheet. The under sheet being the one used to cover the mattress. The draw sheet is thus named because it is

tion when the patient is convalescent, but, when a helpless patient has to use the bedpan, further protection is advisable and either an extra quilted pad or a rubber sheet should be put on over the under sheet, before the draw sheet.[1] Ordinarily, this extra protector and draw sheet are not used when the patient is well enough to be up, but they are shown in this demonstration because it is easier to learn how to adjust them when there is nobody in the bed.

2. *Fix the sheets that will be under the patient so that they will remain without wrinkles.* This requires: (a) That the sheets be put on perfectly straight, otherwise, the material is, as it were, on the bias and when this is the case, if the sheets become at all loosened they will wrinkle; (b) the sheets must be stretched tightly before they are tucked under the mattress; (c) the sides of the sheets must be tucked under the mattress to the center of the bed so that the patient's weight will be over them and help to keep them in place.

3. *Do not tuck the upper clothes far under the*

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so arranged that when the part the patient is lying upon gets uncomfortably warm, it can be drawn forward and a fresh part provided. In hospitals long narrow sheets are usually provided for the purpose but, in the home, an ordinary sheet can be doubled lengthwise and adjusted with the length across the bed. Another reason for the use of this sheet is that it can be tucked farther under the mattress than the under sheet and therefore it does not wrinkle as easily.

[1] See foot note page 47.

Fig. 6. Mitering a corner of the under sheet.

mattress for, if you do, the under ones will be loosened when the bedcovers are turned down.

4. *Avoid wasting time and energy.* In order to do so collect everything that you will need for your work before you begin and do your work in an order that will necessitate going round the bed as seldom as possible.

5. Keep the surroundings neat while you work, and do not consider that you have finished making the bed until you have put the chairs and table in place and removed everything that should not be left on the table.

Procedure: Put the mattress in place and cover it with the protector.

Cover this with a sheet. Let the sheet extend about eighteen inches beyond the mattress at the top to allow for tucking in and leave exactly the same length on either side. Be sure that the sheet is straight. There are two methods of arranging this sheet, in one method the *envelope corners*, which help to hold the sheet in place, are made at the sides and, in the other, the corners are made at the top and bottom. **For method 1,** *i.e.*, with the corners at the sides: Tuck the sheet under the mattress at the top, go to the foot of the bed, pull the sheet firmly and tuck it in there. Miter (*i.e.*, fold like an envelope) the upper and lower corners (see Fig. 6) and then tuck in the sheet along the side on which you are standing. **For method 2:** Tuck in the sheet along the side on which you are standing, but leave it loose at the top and bottom.

Put on the extra protector, placing it where the lower part of the back, buttocks, and upper part of the thighs will rest.

Cover this with the draw sheet. Leave the latter a little bit longer on the side at which you are standing than the other. Tuck it in on this side. It should extend from slightly under the pillow to about the same level of the patient's knees and at least two inches beyond the top and bottom of the protector.

Go to the opposite side of the bed. Turn back the draw sheet and extra protector, so that they will be out of your way while you first stretch, and then tuck the under sheet beneath the mattress. To do this **for method 1** miter the corners on the side at the top and bottom, as on the other side, stretch a portion of the sheet as forcibly as you can (Fig. 7, in which the sheet is being pulled with one hand while the edge of the mattress is pushed back with the other, shows a good way of getting the sheet tight) and then tuck it as far under the mattress as possible. For **method 2**, treat the sheet in the same manner, but begin to work about the middle and proceed first toward the foot and then toward the head of the bed. Fold the top of the sheet like an envelope and tuck it under the head of the mattress and then do likewise at the foot.

See that the protector is in place and free from wrinkles, if it is so wide that it has to be tucked in treat it in the same manner as the draw sheet.

Fig. 7. Method of adjusting the under sheet tightly when the corners are mitered at the foot, instead of the sides of the mattress.

Stretch and tuck the draw sheet under the mattress in the same way as the under sheet.

Put on the top sheet with the hem wrong side up, so that the right side will be uppermost when the sheet is turned down over the blanket and spread. Have the upper edge of the sheet on a line with the rim of the mattress. Tuck the sheet under the mattress at the foot, miter the lower corners, as in the under sheet, the sides may be allowed to hang or they may be tucked under the mattress, but not as far as the under sheets. Neatness is the main consideration in the arrangement of the upper bedclothes.

Put on the blankets, have their upper edges about eight inches from the top of the mattress, tuck them in at the bottom and arrange the sides in the same manner as the sheet.

Put on the spread, have its upper edge on a line with the top of the mattress. Tuck it in at the bottom, fold the corners neatly.

If necessary, put clean cases on the pillows, shake them, get their corners into those of their cases, press them with your arms, on a table, until they are perfectly flat and then put them on the bed.

To turn down the upper covers, when the patient is ready to go to bed: Turn the top edge of the spread over the blankets and the top of the sheet over this. If the covers have been tucked under the mattress, set them free and to do this, without loosening the under sheets, keep one hand grasping

them and the edge of the mattress, raising the latter very slightly, while you pull out the upper covers with the other hand. Then turn down the covers; there are two common methods of doing this: (1) Grasp the upper edge of the clothes on each side of the bed between your thumbs and fingers and fold them down to the center of the bed, draw the upper half of this fold upward, making a double fold with the upper edge of the clothes facing the head of the bed. (2) At one side turn back the upper half of the clothes in a triangular fold. This will mean that the upper edge of the clothes will lie along the edge of the mattress at the side farthest from you.

Demonstration 4

Changing the Sheets with the Patient in Bed

Equipment for demonstration:

The same as for Demonstration 3 plus two extra sheets, two nightgowns and a "patient." The doll may be used for the patient, but it is very much better for the pupils to take turns being patient for demonstrations of this kind. Have the "patient" in bed.

Procedure:

1. Be sure that everything necessary for the work is at hand and arrange the table and chairs, as in Demonstration 3, for the reception of clothes taken from the bed.

2. Take off the spread, fold it, and put it where it will not get crushed. If there are two blankets on the bed, remove the upper one.

3. Loosen the bedclothes on all sides. To do so, raise the mattress with one hand and draw the clothes out with the other, so as to avoid risk of jarring the patient and tearing the clothes.

4. Change the top sheet. To do this, place a clean sheet over the blanket that remains on the bed, cover this with the other blanket; turn about ten inches of the sheet over this blanket at the top; if the patient is not too ill she can usually be asked to hold the upper edge of these, otherwise they can be tucked under her shoulders or under the pillow to retain them in place; then, standing near the foot of the bed, pass your hand under the clean sheet, take the covers that are to be removed near their center and draw them out. Never expose the patient while doing this. Separate sheet and blanket and place them across the chairs.

5. Fold the sides of the blanket and top sheet up over the patient, leaving the fold just long enough to cover her if she is turned. This answers a threefold purpose: it gives a neat appearance; the clothes are not in your way while you work; it keeps the patient as warm as before the upper blanket was removed.

6. Draw the patient to one side of the bed.

7. Arrange the pillows. To do this: Slip one arm under the patient's neck and far shoulder, letting her head rest on your arm (see Fig. 3); raise

her slightly and with your free hand remove the pillows, pulling them outward. It is usually easier to remove them one at a time. Before replacing the pillows, shake them and see that their corners fit into those of the cases. Do not let them rest on the bed while doing this. To replace them, put them one on top of the other, at the head of the bed close to, but on the far side of, the patient; raise the patient as when removing the pillows; pass your free hand back of her and, taking hold of the lower pillow, draw both pillows into place. Arrange them so that the patient rests comfortably. Do not allow an unconscious or helpless patient's head to be thrown forward on the chest, for such a position will interfere with proper breathing.

8. Change the nightgown. **Important points to remember when doing so are:**

(1) When a patient is weak or helpless, if the sleeves of the gown do not slip off readily, slip one of your hands through an armhole, grasp the patient's arm about the elbow, and, bending it slightly, draw it backward while, with your other hand, you pull the sleeve either at the armhole or the wrist.

(2) Get a weak patient's arm into the sleeve of a gown by putting your arm through the lower opening, grasping her hand, including her thumb, and drawing the arm through the sleeve.

(3) If an arm is injured, remove the sleeve from that arm last, but put the sleeve of the clean gown on it first.

(4) Be sure that the gown is well pulled down and free from creases. If the gown opens down the back, it is usually better, especially if the patient is weak or helpless, not to put the lower ends under her as they are likely to become wrinkled.

Procedures in changing the nightgown:

Method 1. If the gown opens down the back, remove one sleeve of the gown to be discarded and put on the corresponding sleeve of the fresh one. Slip the fresh gown across the chest, under the soiled one, to prevent exposure, and change the sleeves in the same way as the first ones.

Method 2. To remove a closed gown, have the patient lie on her back with her knees flexed; pull the gown up as far as possible, then, if the patient is strong enough, have her raise her thighs slightly; if she is not sufficiently strong, place one of your hands under her buttocks and raise her while you draw up the gown with the other hand; raise her shoulders if necessary. When the gown has been gathered up to the shoulders, slip one of your hands through the upper armhole of one of the sleeves, grasp the patient's arm below the elbow, bend it slightly while, with the other hand, you draw off the sleeve; slip the gown over the head and off the other arm.

The best way to put on the gown depends upon its make. If it is narrow at the top and does not unbutton it can sometimes be put on most easily in about the same manner as the soiled one was removed except that the order of things is reversed;

thus one arm is drawn into a sleeve, then the gown is put over the head and the other arm drawn into its sleeve and the gown pulled down, raising the patient while doing so in the same manner as when removing the gown.

Method 3. If the gown is loose at the top and the opening is a fair size, it is best put on by gathering it up loosely and slipping it over the head and then drawing first one and then the other arm through a sleeve. The gown is pulled down as in Method 2.

9. Sweep all crumbs from the bed on the side at which you are standing, using either your hand or a folded towel. Do likewise on the other side of the bed when you go there to adjust the sheets. *Look for crumbs between the sheets.* This procedure should be carried out even when the sheets are changed, for otherwise the crumbs may be scattered on the mattress.

10. Change the under and draw sheets. To do so go to the side of the bed farthest from the patient.

Turn back the draw sheet and protector, so that they will be out of your way while you adjust the under sheet, if they are wide, turn down their upper ends so that they will not come near the patient's face.

Roll one side of the under sheet close to the patient's side.

Gather one side of the fresh sheet to about its center (let it rest on a table or chair while doing so,

not on the patient's bed) and place the gathered portion next the roll of the soiled sheet. *Be sure that the sheet is perfectly straight and that you are leaving an equal amount to tuck in on both sides.*

Tuck in the sheet on the side at which you are standing.

Adjust the protector on this side.

Treat the draw sheet in the same manner as the under sheet with the exception of leaving it longer at one side than the other.

Turn the patient and draw her on to the fresh sheets and go to the other side of the bed.

Remove the soiled sheets.

Stretch the under sheet until it is perfectly free from wrinkles and then tuck the side and ends under the mattress in the same manner as when making a closed bed.

Adjust the protector on this side and treat the draw sheet in the same manner as in Demonstration 3.

11. Draw the patient to the center of the bed.

12. Arrange the upper sheet and blankets in position. Have the upper edges of the blankets under the patient's chin and leave enough of the sheet to turn eight inches over the blanket. Tuck in first the top sheet and then the blankets at the foot, being careful to keep them, especially the sheet, loose over the patient's feet.

13. Arrange the pillows so that the patient lies comfortably.

14. Put on the spread. Arrange it at the foot

and sides as when making a closed bed, but fold it back under the blankets at the top and turn the sheet over it.

(N. B. These details should be carried out in the order in which they are given, since, if there are crumbs in the upper clothes, nightgown, or pillows, they are likely to be left in the bed if these articles are changed after the under sheets.)

15. Remove all soiled clothes and the appliances used for the work. Replace anything that has been moved from its regular place. Be sure that the surroundings are in order and that the "patient" is comfortable.

CHAPTER IV

Preparation of a Patient for the Night

Demonstration 5: Preparation of a patient for the night, including rubbing the back, cleaning the teeth, and doing the hair. How to give and remove a bedpan.

Demonstration 5

Preparation of a Patient for the Night

Equipment for demonstration:

Toilet basin containing hot water. Soap. Hand towel and bath towel. Washcloth. Tooth paste. Toothbrush, or substitute; *a strip of whalebone covered at one end with absorbent cotton is an excellent substitute for a toothbrush when the patient is too ill to clean her own teeth, because the whalebone can be bent to follow the contour of the mouth.* Alcohol, 50 per cent. Talcum powder. Either the doll or, preferably, a pupil in bed to act as patient.

Procedure:

1. Place a chair at the foot of the bed.
2. Draw the patient to the side of the bed.
3. Loosen the nightgown at the neck.
4. Place the towel under the chin; wash and dry the face, neck, in and around the ears.

5. Place the towel so that one end will be under the basin when it is placed where one of the patient's hands can rest in it. Arrange the basin in such position and wash her hand, squeezing water from the cloth through the fingers. Dry this hand and then treat the other one in like manner.

6. Place the towel under the chin and clean the teeth. To do this, moisten the toothbrush with water, put some paste on it, move the brush back and forward over the teeth, then tell the patient to hold her teeth apart and brush from the gum downward on the upper jaw and from the gum upward on the lower jaw (*never brush toward the gum*) in front and at the back of the teeth. Wet the brush as often as necessary by pouring water over it, letting the water run into the empty bowl. Brush off the paste. If the patient is strong enough to rinse her mouth and gargle her throat raise her head and let her take a mouthful of water, lower her head, place the small basin where it will be convenient for her to eject the water into it. If the substitute for a toothbrush suggested with the equipment is used, wash your hands before putting the cotton on the whalebone and, when removing it, do not touch it with your fingers; you can cover it with a piece of paper and then draw it off.

7. Turn down the spread and upper blanket over the foot of the bed and chair.

8. Turn the sides of the remaining blanket and upper sheet over the patient as in Demonstration 4.

9. Wash and then rub with (a) alcohol, and (b) powder the axillæ, back, and hips, and any other parts necessary for the prevention of pressure sores or chafing.

To wash the back: If possible have the patient on her side; if she is weak turn her toward you as you can then support her with one arm while you work. Turn back the upper corner of the bed-clothes enough to have them out of your way but not enough to expose the patient unnecessarily. Protect the bed by putting the bath towel close to the patient's back. Wash first with soap and then clear water. Do the neck and shoulders first. Dry each part as soon as you finish washing it.

To rub the back: Pour a little alcohol on your hand and rub it on the back around the shoulders and neck, then place your hand firmly on the skin and move the flesh on the bone, repeat until you have gone over the entire back and hips; pay special attention to any parts that look red. Pour a little powder on your hands and rub it over the back; do not use much.

10. Shake the nightgown to make sure that there are no crumbs caught in it.

11. Go to the side of the bed farthest from the patient. If there are crumbs in the bed brush them out with a folded towel.

12. Loosen the draw sheet and, if it is wrinkled, the under sheet. If the under sheet has been loosened, stretch it and tuck it under the mattress again. Tuck the end of the draw sheet under the

mattress but leave a portion loose and move this up against the patient's back or, if possible, somewhat under her.

13. Draw the patient to the center of the bed.

14. Go to the other side of the bed. If there are any crumbs, brush them off with the folded towel.

15. Raise the mattress with one hand and, with the other, draw out the sheets. In turn stretch each sheet until it is perfectly free from wrinkles and then tuck the free portion under the mattress.

16. If necessary, tighten the under sheet at the top and bottom of the bed.

17. Arrange the nightgown so that it is free from wrinkles and fasten it.

18. Arrange the upper covers in the usual manner.

19. **Comb and brush the "patient's" hair.** To do this: Place a towel under the "patient's" head and across the shoulder nearest to you. Set the hair free, part it in the center from the forehead to the nape of the neck and be sure to make the part clear. Comb and then brush the strand of hair on the side at which you are standing. If it is tangled, begin to comb at the free end and, while you are loosening the snarl, hold the hair between the tangle and the head. Braid this strand, beginning close behind the ear; be sure that the hair between the part and the braid is loose enough to avoid pulling the hairs, but not more so. Go to the other side of the bed and repeat the procedures.

If the "patient" does not wish to have her hair done in two braids, instead of braiding the second strand, undo the first and dress the hair as required. Two reasons for arranging the hair in two braids are (1) it is more comfortable for the patient if she has to lie on her back; (2) it is then easier to brush and comb it and to keep it free from tangles.

20. Be sure that the patient is comfortable.

21. Remove all appliances used and tidy the surroundings.

22. Make sure that the ventilation is adequate and the temperature of the appropriate.

To Give and Remove the Bedpan

Another item that is usually essential in the preparation of a patient for the night's rest is to give her a bedpan. This procedure cannot very well be demonstrated in class but, some idea of how to carry it out can be gained from the following description:

If the pan is cold, warm it. This is usually done by letting hot water run over it. Be sure that it is dry before you take it to the patient. Take with it a cover (this is usually either double-faced rubber or heavy washable material), toilet paper, and, if the patient expects to have a defecation, a sheet that is kept for this purpose.

If possible, flex the patient's knees and place her feet firmly on the bed.

Place the pan on the bed near the patient.

Put your hand which is nearest the head of the bed under the buttocks (stand, if practicable, at the side of the bed which will allow of this being your left hand); raise the patient and slip the pan into position. Make sure that it is well placed.

If the patient expects to have a defecation put the sheet, folded, under the upper covers, over the patient's legs and around the sides of the bedpan (this helps to prevent an odor permeating the bed), and get two compresses of gauze or soft, old muslin and a basin of hot water.

When the patient is ready to have the pan removed, if her knees are not flexed, flex them; arrange the bedcovers so that they will be out of your way, but do not expose the patient. If the patient is not able to use the paper, do so for her. Put one hand under the buttocks and raise the patient as when giving her the pan. It is most important to do this for, if you neglect it, even when the patient can move without your help, the pan may be jerked and some of its contents spilled. Cover the pan at once.

If the patient had a defecation put a compress under the rectum and then wash around this part. Use the compress placed under her for drying.

If the defecation is very odorous it is better to remove the pan before washing the patient, but, otherwise, as the washing need only take a few seconds, it can be done first.

Wash the compresses used and keep them for the same purpose.

Never empty a bedpan without noting its contents and if this has the slightest unusual appearance empty it into a vessel in which it can be kept tightly covered and show it to the doctor.[1]

After emptying the pan flush it first with cold[2] and then with hot water and be sure that it is absolutely clean.

[1] Feces represents (1) the food material that has escaped digestion; (2) secretions from the glands and lining membrane of the digestive tract and associated organs; (3) bacteria that have been in the alimentary canal and their products; thus abnormal conditions of digestion and of the lining of the canal and of the liver and pancreas can often be ascertained by examination of this excreta. The liver and pancreas manufacture secretions necessary for digestion and, therefore, if they are diseased digestion will not be normal.

The urine contains the greater part of the waste products of metabolism, except the CO_2, and changes will occur in the nature of these when metabolism is defective; also, if there are foreign substances in the blood, such as medicine, toxins of bacteria, etc., they will be eliminated chiefly in the urine, as will be also material normal or abnormal, thrown off by the cells or membrane lining the urinary tract (kidneys, ureters, bladder, urethra). Thus the physician can often obtain valuable information regarding the patient's condition by examination of the urine.

[2] Both urine and feces contain material that is coagulated by heat and thus if hot water is poured into the pan first the latter will be harder to get clean and to free from odor.

CHAPTER V

Essentials for a Patient's Comfort

Principles involved in making a patient comfortable under varying conditions, including when she is out of doors in cold weather. Causes and prevention of pressure sores and chafing. Demonstration 6: Methods of making a patient comfortable when: (1) Lying in different positions; (2) sitting up in bed. Demonstration 7: Preparing a patient to get out of bed and making her comfortable in a chair.

The **equipment** for Demonstration 6 is given on page 82, and for Demonstration 7 on page 86.

Essentials for a Patient's Comfort

People, when ill, are, as a rule, more easily irritated and worried by trifles than when they are well, because, normal brains possess the power of directing thought so as to restrain any tendency to be too easily influenced by slight annoyances, but the conditions existing in illness will affect the brain as well as other organs and it is just as impossible for a brain that is in an abnormal condition to function properly as, for examples, a muscle or the stomach. Unfortunately, there are few things worse for the brain than mental irritation and worry and, especially as all the organs of

the body are more or less under the control of the nervous system and their functioning thus likely to be interfered with when this system is abnormal, the prevention of anything that will induce mental irritation is one of the very essential principles of nursing.

For this reason (1) a sick person should not be told anything that will be likely to annoy or worry her; (2) her wishes should be complied with as far as possible and, when they clash with what seems right, the decision should be left to the doctor or nurse; (3) all sources of physical irritation are to be avoided, examples of these are:

1. Excessive heat or excessive cold.
2. Annoying noises and lights.
3. Lack of comfortable support with pillows, or when being moved.
4. Crumbs in the bed.
5. Wrinkles in the sheet, nightgown, etc.
6. Being obliged to remain too long a time in one position.
7. Weight of the bedcovers upon the feet or a painful part.
8. Dampness of the bedclothes or skin.
9. Excessive pressure upon a part by a splint, bandage, or other appliance.

Pressure sores: The causes of discomfort just mentioned, with the exception of the four first ones, are also to be avoided because of their tendency to induce ulceration or breaking down of tissue known as *pressure sores* or *bedsores*. They do this

because the cells of body tissues depend upon material derived from the lymph[1] for their nourishment and repair[2] and, when the blood is not being forced through the blood-vessels as vigorously as under normal conditions, even slight pressure will interfere with the flow in the small vessels of the skin, consequently, the blood remains in the vessels of the area after it has lost its nutritive supply causing congestion and hindering the inflow of fresh blood.

Crumbs and wrinkles in the sheets, etc., may not only cause pressure, but they also rub or chafe the skin and may cause it to break, and moisture, even such as may be present as the result of excessive perspiration, tends to help this effect. If the skin breaks, bacteria, which are always present, will get into the deeper tissues of the part and help in its disintegration.

The parts of the body in which pressure sores

[1] Lymph is the name given to the fluid which passes from the blood through the small blood-vessels known as *capillaries*. Lymph contains (1) the water and food material (absorbed from the intestines) which the cells need for their nourishment; (2) the oxygen (absorbed while the blood circulates in the lungs) which is required for those chemical changes in material brought by the lymph, that give rise to heat and energy and produce the CO_2 and other waste matter that passes into the lymph vessels and blood-vessels and is carried to the lungs and kidneys to be excreted; (3) substances manufactured in body glands and absorbed by the blood which promote the chemical changes that occur in the tissues; (4) substances that protect the body from bacteria and their toxins.

[2] Material of the tissue cells is being constantly destroyed and must be replaced by substances from the lymph.

Fig. 8. Changing the under sheet.

will form most rapidly are the buttocks and over bony prominences, such as the end of the spine, the heels, shoulder blades, elbows, and, on children, the back of the head.

Chafing—*i.e.*, friction—will cause breaks in the skin very readily, even when there is no pressure, if the skin is allowed to remain damp. It occurs most frequently in parts where two surfaces of the body come in contact, as between the buttocks or under the breasts. It is most likely to occur in stout elderly people and young children. A similar condition will occur on the buttocks of infants whose diapers are not properly attended to, this will be discussed in Chapter IX.

One of the first **signs that harmful pressure** is being made upon a part is a deep redness of the skin. This is due to the congestion resulting from the interference with the circulation in the area as described above. There is also likely to be pain, especially when the pressure is due to a tight or improperly adjusted bandage or splint, but the pain does not always persist, either because the pressure interferes with the passage of nerve-impulses[1] or because the nervous mechanism in-

[1] Sensations are perceived or interpreted in the brain and not at the outer surface of the body, if, for example, a person cuts her finger, the sensation produced is not really in the finger, but in the brain. A proof of this is that when either the sensory nerves leading from (for example) a person's legs to the spinal cord, or the fibers extending up the cord to the brain are destroyed, pain in the legs will cease to be felt, the legs could even be amputated without causing pain.

volved becomes accustomed to the stimulus and ceases to be affected by it.[1] Therefore, if a part remains red, even though there is no pain, means must be taken to reduce pressure. Redness of the skin is also **characteristic of chafing,** because irritation of a part, from any cause results in dilation of the blood-vessels[2] in the area affected, which interferes with the flow of blood through these vessels and congestion and, consequently, redness of the skin results. Other common consequences of chafing are eruptions of pimples and itching of the skin.

The means of preventing pressure sores and chafing are: To protect threatened parts from pressure and to keep the skin clean and dry.

Excessive bed-pressure can be relieved by changing the patient's position frequently and by putting pads or rings under areas which show the effects of pressure and, when a patient has to lie for a long time in the same position, an air-mattress[3]

[1] Mild stimuli often cease to be perceived after a time. A common example of this is the rapidity with which we cease to be aware of an odor that we perceived on entering a room, except when the odor is very strong.

[2] It is not always known why irritation causes dilation of blood-vessels because local dilation can be induced in at least three ways, namely: (1) Depression of the walls of the vessels by chemical substances formed in the tissues when they are active; (2) depression of the nerves which carry the impulses to the blood-vessels that keep them in a state of contraction; (3) stimulation of those nerves which transmit the impulses to the blood-vessels that cause their dilation.

[3] A sack that when air is pumped into it assumes the shape of a mattress.

should be obtained if possible, for this, if it is properly prepared,[1] will yield to the weight of the body and thus make less pressure against it than an ordinary mattress.

Pressure and friction by splints and the like will be avoided by padding the appliances and adjusting them properly, this will be described in a subsequent Chapter XIV. Of course any appliance put on by a doctor is not to be changed without his permission, but it must be realized that a bandage, etc., may become too tight or too loose even when properly applied because of increase or reduction of inflammation in the part to which it is applied.

The usual means employed to keep the skin in good condition are: (1) Washing it very gently at least twice a day with warm water and a little pure soap, using a very soft cloth and patting, not rubbing, red areas; (2) applying alcohol[2] and, after this has evaporated, a little powder to all threatened parts after they have been washed and, if the areas are very red, as often as every two or three hours; (3) massaging the parts—this is done while the alcohol is evaporating. While massaging, keep the fingers still on the part and move the tissues, on no account rub the skin either when massaging or washing it, for doing so may break it.

Adequate support, as stated on page 67, is very

[1] Enough air is to be pumped into it to keep the patient from touching the springs of the bed, but not so much that the mattress becomes firm or inflexible.

[2] Alcohol tends to dry and harden the skin.

essential for comfort when a person is ill. It is hard for a person who has never been ill or observed very ill patients to realize how thorough support must be to prevent a sense of strain and tiredness. It may, for example, be almost impossible for a weak person to lie on her side unless pillows are so arranged that she can rest against them and, in almost any position, small pillows may be needed under the curve at the waistline. If the legs are flexed, support will be required under the knees and, even when sitting up in bed, a patient is likely to want her legs flexed a great part of the time for this relaxes the muscles of the abdomen and thighs. Support may also be required to keep the patient from slipping down in bed, this is especially likely to be the case when she is sitting up or when her condition makes it necessary to raise the head of the bed.

It would be quite impossible to give exact descriptions of arrangements of pillows that would be comfortable to all patients for so much depends upon the patient's condition and the size of the pillows. The accompanying illustrations give some idea of methods of arrangement with the patient in different positions. In most of these, it will be noticed, there is only one pillow under the head for, except when the patient is suffering from a disease that is associated with difficult breathing or other condition requiring some special position, she, if very ill, is usually kept in as nearly a horizontal position as possible for, as will be seen in Chapter VII, this minimizes the work of the heart. Most

convalescent patients, however, especially during the daytime, prefer to have a second pillow and,

Fig. 9. Dorsal or supine position. With the knees raised to relax the tension of the abdominal muscles.

in such case, the lower one should be placed further under the patient's shoulders than shown in Fig. 9 and the upper one in about the position shown in this illustration.

Fig. 10. Prone position. The bedclothes are folded down to show the arrangements of the pillows.

Fig. 9 shows the position a very ill patient will lie in the greater part of the time when a special one is not necessary. In Fig. 10 the patient is lying

prone with a pillow under the head and one under the chest, such a position is sometimes necessary after surgical operations, otherwise, it is usually only a temporary one, but it may afford relief to a patient who has been lying on her back for a long time. In Figs. 11 and 12 the pillows are placed

Fig. 11. Lateral (side) position.

behind the patient's shoulders and thighs and a small one under the curve at the waistline. The main difference in the two illustrations is the patient's position, and they are both shown in order to emphasize the fact that even such slight change of position will afford relief to a patient who is restless and tired of staying in bed. In Fig. 13 the two lower pillows are placed obliquely, one on each side of the patient, with a corner fitting into the curve of the back at the waistline and the greater part of each pillow affording a support for her arms, another pillow, a small one, is placed at the patient's back and another behind her head. See

Fig. 12. Same as Fig. 11 but showing different arrangement of pillows.

Fig. 14. The back-rest in Fig. 13 is an adjustment that is attached to the bed and that in Fig. 14 is a

Fig. 13. Patient supported in sitting position when the bed has an adjustable back-rest.

very commonly used variety, but a chair with a wide, flat back, placed upside down, with the upper

Fig. 14. Suitable arrangement of pillows when a separate back-rest is used.

edge of the back and the outer edge of the seat resting on the mattress, as shown in Fig. 15, will

make a fairly good substitute. A large pillow should be placed lengthwise against the back of the chair and the other pillows arranged in front of this.

The support under the patient's knees in Fig. 13 is what is known as the *Meinecke non-slipping knee brace*, it has rough rubber pads on its under surface which inhibit its slipping. A pillow is usually placed between the brace and the patient's thighs. As a substitute for such a support, a folded pillow can be used and, if necessary to keep it from slipping, it can be doubled and tied over a piece of strong, heavy, preferably white twine, and the ends of the twine passed through interstices of the wires and tied to the bars at the sides of the bed on a line with the pillow and, if the patient is heavy, to a bar at the head of the bed, as shown in Fig. 14.

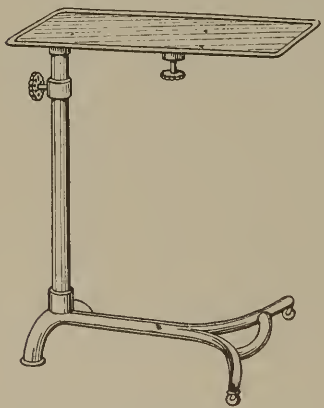


Fig. 16. Suitable table for use as described on page 81.

A pillow or brace, secured in place as just described, is a great help in **preventing a patient slipping down in bed** and, sometimes, either in addition to, or instead of this, a brace is placed at the feet, and, in this location, a wooden box such as can be

Fig. 15. A chair used as a back rest.

purchased for a few cents at any grocery store, will answer the purpose. If the box is large enough to extend from the patient's feet to the foot of the bed, it will probably not be necessary to do anything to secure it in place, otherwise, a small hole can be made in each side, twine passed through these and tied to the bed as just described. A pillow or folded pad will be needed between the box and the patient's feet.

A method of supporting an injured leg is shown in Fig. 17; the leg is resting on a padded splint, which consists of a piece of board a little wider than the leg and the length of the leg from the knee to the foot with a piece of board the size of the foot nailed to the longer piece in position to support the foot; the splint has a hole in each corner through which twine is passed and the latter is tied to the cradle. Pillows and small pads are so arranged that thigh and leg are well supported. Having the splint tied in this way to the cradle and the leg slightly raised allows of changing the patient's position, changing the sheets, etc., without moving the injured leg.

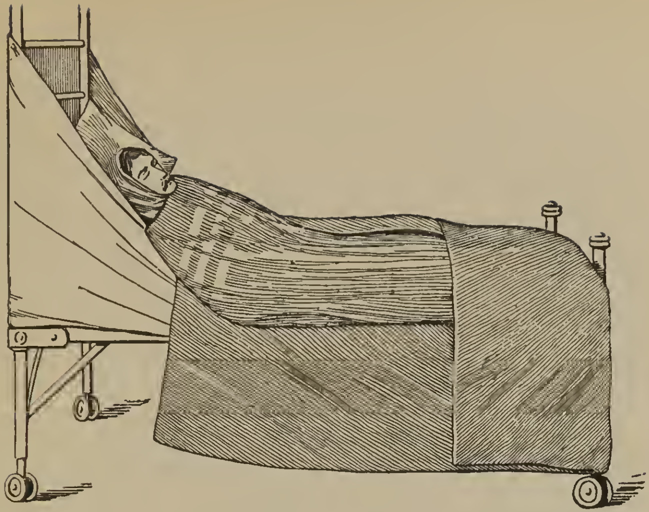
The weight of the bedcovers, as previously stated, may be a source of discomfort to a patient. Conditions in which this is most likely to be the case are: (1) When the covers rest upon a part of the body in which there is pain; (2) when they rest on the toes, as when a patient is lying on her back without her knees flexed; (3) when very heavy covers are used, as when the patient is sleeping out

of doors in cold weather. There are supports commonly known as *bed-cradles* that are put under the covers over the part that is to be relieved from their weight, but, if a cradle cannot be obtained, a wooden box with two ends removed will answer the purpose.

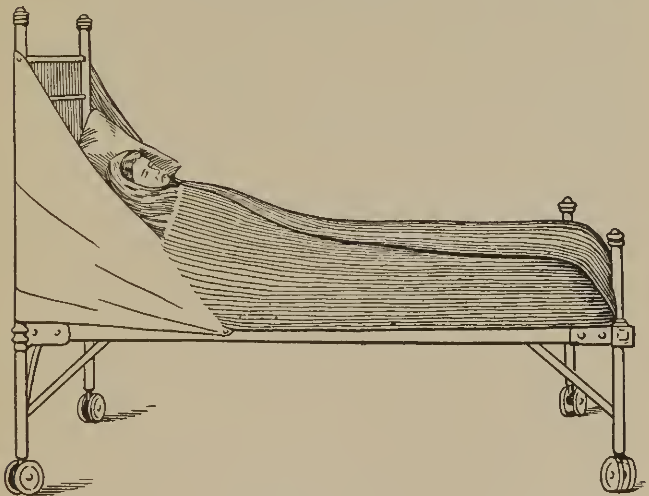
When a patient is sleeping out of doors in cold weather it is often quite a problem to keep her warm without using excessively heavy covers. Some helps to doing so are: To put a hot-water bottle or bottles in the bed (for care when filling bags, see page 179), to provide flannelet sheets and nightgown, instead of cotton ones, and to put a large, thick, colored blanket (or two sewed together if one large enough cannot be obtained) under the mattress and fold its sides and lower end over the mattress as shown in Fig. 18. If the weight of this blanket annoys the patient put a large cradle or other support under it. This blanket must be large enough for the sides to overlap each other for a considerable distance, its main purpose being to prevent cold air getting under the covers. The bed is made in the usual way, except that, as a rule, the covers are tucked under the mattress at the sides.

The proper support of a patient while she takes a drink is another item to be considered in connection with a patient's comfort. A patient who is at all weak should not be expected to hold the glass or drinking tube. If a glass or tube cannot be obtained from which she can drink without effort

Fig. 17. Injured leg supported as described on page 77.



PARTLY ADJUSTED.



FULLY ADJUSTED.

Fig. 18. Arrangement of blankets when patient is out of doors in cold weather.

while lying down she should be raised as shown in Fig. 20. It is to be noticed that the nurse has her arm under the pillow.

Amusement during convalescence is a very important item to be considered in connection with a patient's comfort. The most appropriate form of amusement will depend, of course, upon the invalid's age and disposition and, if convalescence is at all prolonged, it will have to be varied, *e.g.*, work, games, and reading. Children especially like to make things and it will be well for those who may have to amuse them to purchase one of the many books now to be had describing work that can be done in bed, such as making paper articles, basket work, and bead work.

Nearly everyone that is old enough likes to be read to or to read. There is, however, a very important objection to the latter form of amusement and to any kind of fine work, for a person who has been ill for a long time, namely, strain on the eyes. In order to see things near at hand, especially small things such as letters and stitches, a change has to be made in the shape of what are known as the crystalline lens of the eyeballs (see page 166) and this change is brought about by very small and delicate muscles that are attached to the lens and to the walls of the eyeballs. These muscles, after a person has been ill for any length of time, are likely to be weak and, if kept in a state of contraction (as they are when a person is reading) for a long time, they may be injured. Also,

Fig. 19. Holding glass and drinking tube while patient takes a drink.

unless the book or work is held about on a level with the eyes, the muscles that rotate the eye downward are under constant strain and this, and the bent position in which the head is generally kept when a book is held too low, tend to promote congestion in the eyes. Because of the danger of eyestrain, and consequent injury to sight, a patient who has been ill for any length of time should not be allowed to read or sew until the doctor gives permission, and when she is allowed to read, her book is to be placed where it will be nearly enough on a level with her eyes to make it unnecessary for her to bend her head and it should be supported on an adjustable table or a substitute[1] so that she will not have the exertion of holding it.

If artificial light is necessary it should be on a level with the top of the head or slightly higher and should shine over the left shoulder.

The patient should positively not be allowed to read or work after she becomes tired and drowsy, for in these conditions there is a natural tendency for the muscles of the eye to relax and prevention of this by mental effort induces very harmful strain upon the muscles.

[1] A good substitute for a reading-table when a person is in bed is a wooden box, the required height, with enough of both sides removed to allow of placing the box across the patient's thighs. The required tilt can be obtained by placing magazines under the far edge of the book and the latter can be kept open by driving a couple of nails into the edge of the box where the free ends will hold the pages.

Demonstration 6

Methods of Making a Patient Comfortable in Different Positions

Articles required: 1. A bed made in the usual manner.

2. An air-ring or a substitute. A commonly used substitute consists of a pad made of several thicknesses of wadding or cotton waste stitched between two pieces of soft, old muslin, with a hole in the center slightly larger than the part which is threatened with a bedsore.

3. Four pillows in addition to the two on the bed. Two of the pillows should be small ones.

4. A back-rest and a chair with a wide flat back to use as a substitute.

5. A shoulder wrap.

6. About four yards of heavy, preferably white, twine.

7. A knee support, see page 76.

8. A wooden box about one foot high and two feet long.

9. A bed-cradle and a box with its two ends removed to act as a substitute.

It is well for the pupils to alternate being subject for this demonstration.

Procedure: Make the patient comfortable, (1) lying on her back; (2) turned on her side; (3) lying prone; (4) sitting up in bed. Put the air-ring

Fig. 20. Supporting patient while she takes a drink.

properly inflated[1] or a substitute under the spine when the patient is on her back and under her hip when she is lying on her side. In each of the positions in which the patient is lying down place the bed-cradle or substitute over some part of the body and arrange the covers over it in such a manner that they have a neat appearance. After placing the patient in the sitting position take measures, such as described on page 76, to prevent her slipping down in bed.

Procedure: Arrange the articles that you will need for the position in which you are to place the patient where you can reach them and in the order in which you will require them.

For the prone and lateral positions turn the patient on her side as directed on page 41, put the pillows in place, and then turn the patient on or against them as the desired position requires.

To sit a patient up in bed, when there is no adjustment as shown in Fig. 13 on the bed,[2] raise patient by passing your arm that is nearest the head of the bed behind her as described on page 43; have the patient place her hands palms downward

[1] Small bulbs can be bought for inflating such rings, but it can be done equally well by blowing into the valve on the side of the ring. Put a piece of muslin around the valve before putting it into the mouth and be sure and close the valve before removing it from the mouth. Just enough air is to be put into the ring to keep the affected part off the bed; if the ring is made too taut it will cause as much pressure as the mattress.

[2] Such a rest is raised, and, with it, the patient, by turning a lever provided for the purpose.

on the bed and, by pressing upon them, help to lift herself as you raise her into a sitting position. If she needs to be supported, put your other arm across her chest and, if necessary, let her head rest on your shoulder. Put the wrap around her shoulders and make sure that it will remain in place. Arrange the back-rest and pillows as described and then take means to prevent the patient slipping down in bed.

Demonstration 7

Preparing a Patient to Get out of Bed and Making her Comfortable in a Chair. Putting her Back to Bed

Important points to be considered: When we are well and our minds are occupied we are not usually conscious of the pressure of our clothes unless they are uncomfortably tight, but, when a person is ill, the nerve stimulation caused by the pressure of corsets and skirt bands, even though they are not actually tight, may give rise to a sense of discomfort. For this reason, as well as to avoid tiring the patient by unnecessary preparation, she is, as a rule, clothed only in a nightgown, wrapper, stockings, and slippers when she gets out of bed, if she is not well enough to walk around. She should be provided with round garters but they must only be tight enough to prevent her stockings slipping when she steps from the bed to the chair.

As the patient's clothing is very scanty, wraps of some kind must usually be provided. The most appropriate nature and arrangement of these will depend upon the temperature of the room, but unless the weather is very warm there should be one to put around the shoulders and another to wrap about the legs and feet. The latter cover can be laid across the patient and hang loose if the place is warm, but if it is cold, especially if the patient is to sit out of doors, it is well to place the center of this wrap[1] under a pillow in the seat of the chair and the lower part of a pillow placed against the back of the chair, it must extend far enough beyond the lower end of the pillow in the seat to be turned up over the patient's feet to her knees and to be wrapped about her legs and tucked under the pillows. If the patient sits in an upholstered chair and pillows are not used, the wrap is placed in the chair and wrapped about the patient as just described, it should extend well above the waistline. The other wrap is pinned around the patient's shoulders. If the weather is cold and the patient is out of doors, a soft cap or hood will also be needed and it is well to place a hot-water bottle at her feet.

A comfortable chair must be provided. A good variety is that known as a *steamer chair* as it has a foot-rest. If the chair used has no such attachment, a footstool will be needed. If the chair is

[1] A colored blanket or a steamer rug will, probably, be the most suitable kind.

not upholstered, a pillow should be put in the seat and another against the back and, if possible, a small one over the top in position to form a support for the head; a pillow for this purpose will probably be needed even with an upholstered chair.

Placing the chair is another important point to consider when a weak patient is to sit up out of bed, and, naturally, the first point to be considered, unless there is someone present who is strong enough to carry the patient, is to have the chair where she can reach it without unnecessary walking. There may, of course, be other points to be considered such as having the chair near a window, or out of a draft. The means of making any such requirement comply with the first-mentioned requisite should be decided before arranging the pillows and wraps in the chair, unless the latter can be easily moved after the patient is in it.

To arrange the chair so that little walking will be required place it either parallel with the bed, facing the head; or else at right angles with the bed facing it, if it is near the head, but with its back against it, if near the foot.

Articles required:

1. Bed made in the usual manner and with a patient (preferably a pupil) in it.

2. Wrapper. It is well to provide and use, in turn, both a closed wrapper and a kimono.

3. Stockings and round garters.

4. Chair, for demonstration it is better to use

a chair that requires to be made comfortable with pillows.

5. Footstool, unless there is a foot-piece to the chair.

6. Pillows, two large and one small.

7. Two wraps and a safety pin.

Procedure:

1. Arrange the chair, *i.e.*, put it in position, put a wrap in the seat and against the lower part of the back, as described on page 85,[1] put a pillow in the seat and one against the back, but do not put the small one for the head in place until the patient is in the chair.

2. Put on the patient's wrapper. If this is a closed one put it on in the same manner as a closed nightgown; if it is a kimono pattern and the patient is well enough let her sit up in bed and hold the wrapper while she slips her arms into the sleeves, do not draw down its skirt until the patient gets out of bed. If the patient is not well enough to sit up, spread the kimono out on the side of the bed, under the top covers, draw the patient over until she lies on its back width and put her arms[2] into the sleeves, fasten it in front.

3. Draw the patient to the edge of the bed.

4. Put on her stockings: to do this, turn the part of the stocking foot below the heel into the

[1] It is better, in demonstration, to arrange the wraps for cold weather because there is no special point in their disposal when it is warm.

[2] If time permits both methods of putting on a kimono and also a closed wrapper should be demonstrated.

leg of the stocking, slip the stocking foot over the patient's foot and pull up its leg. Put on round garters.

5. Turn the bedcovers down to the foot of the bed so that they will be out of the way.

6. Get the patient out of bed and place her in the chair. To do this, if she is well enough to take a few steps, but needs help: Raise her and turn her so that her legs will be over the side of the bed. Have her put a hand on your far shoulder, put your arm around her waist and support her as she walks to the chair.

If the patient is not well enough for this exertion, get an assistant, stand one on either side of the patient, let one lifter put one of her arms around the patient's waist and one under her knees while the other puts one arm across her shoulders and the other under her thighs. Have the patient put an arm across each lifter's back and place her hands firmly on their far shoulders. The lifters should stand on opposite sides of the chair while putting the patient into it.

7. Arrange the wraps as already described.

To put the patient back to bed, if she can help herself, put your arm around her waist and have her put her hand on your far shoulder, as when you were helping her out of bed. If the bed is a high one, have the patient stand with her back to it and place her hands upon it; put one arm around her waist and one under her knees; tell her to raise herself slightly by pressing her hands upon the bed

Fig. 21. Supporting patient while adjusting pillows.

and, as she does so, raise her on to the side of the bed and then turn her into position.

If the patient needs to be lifted into bed get an assistant and, standing one on either side of the chair, take hold of her as when lifting her out of bed. It is more difficult to raise the patient from the chair than from the bed, and thus, if the patient is at all heavy, at least one of the lifters must be quite strong. Have the patient place her hands very firmly upon your shoulders; straighten your backs and take the other precautions mentioned on page 40 before attempting to raise her.

After the patient is in bed, draw up the covers; remove the wrapper in the same manner as you would a nightgown of similar cut, see page 55, take off the stockings by slipping your hand through the opening and drawing them down.

CHAPTER VI

Baths. Care of the Hair

Purposes of baths. Effects of cold, hot, and tepid baths and how they produce these effects. What is meant by muscle tone. Reasons for the necessity of cleansing baths. Demonstration 8: Giving a cleansing bath to a person in bed. Care of the hair. Demonstration 9: Cleaning the hair. Demonstration 10: Washing the hair. Demonstration 11: Methods of giving foot baths.

The equipment for Demonstration 8, is listed on page 99; that for Demonstration 9, on page 107; that for Demonstration 10, on page 108; that for Demonstration 11, on page 111.

The Uses and Effects of Baths

The purposes for which baths are most commonly used in the treatment of the sick are: To cleanse the body; to stimulate the nervous system; to lessen nervous irritability; to improve the circulation of the blood; to lessen congestion; to reduce excessive muscular contraction such as occurs in convulsions; to cause sweating and thus rid the body of excess water and waste matter.

Baths, with the exception of those used solely for cleansing, gain their results by the influence of

cold and heat upon the body and, though in this lesson only cleansing and foot baths will be demonstrated, it is well for you to know something of the effects of different external temperatures upon the body. To understand these, you must know that, just under the skin and in the muscles, there are millions of nerve endings which are the termination of what are known as *afferent*[1] *nerve fibers*[2] that extend to what are termed *nerve centers*[3] in the spinal cord and brain, where they connect with other neurones (efferent)[4] which extend outward to the muscles, and to blood-vessels, and to glands, and other internal organs. Some of the afferent nerve endings in the skin are stimulated by heat, others by cold, others by pressure; endings of afferent nerves in the muscles are stimulated by the moving of the muscles and by chemical substances formed in the tissues as the result of their

[1] From the Latin *ad* = to, and ferro = *to carry* = to carry to.

[2] Groups of cell bodies and their uncovered processes form what is known as the *gray matter of the brain and cord.* Some of the processes are short and branching and are known as *dendrites,* others are straight and long, these are called *axons.* Many of the axons extend out beyond the brain and cord to all parts of the body and those which do so are covered with a sheath. The covered axons are known as nerve fibers. A bundle of nerve fibers is called a *nerve.* A cell body and its processes is called a *neurone* or a *nerve cell.* The cell body is sometimes likencd to the chemical battery and the fibers to the wires of an electrical apparatus.

[3] Masses of gray matter that are the origin of fibers over which impulses pass to and from an organ and help to control its functioning are termed *nerve centers.*

[4] From the Latin ef = *out* and *ferro* = *to carry* = to carry out.

activity; the optic nerve endings in the eyes are stimulated by light, those in the ears by the vibrations that we call sound, those in the nose by certain volatile substances, those in the tongue by compounds that are bitter, sour, salty, or sweet. When the nerve endings in the head are stimulated impulses[1] pass to the brain; when those in other parts of the body are stimulated impulses pass to the spinal cord and, sometimes, up the cord to the brain. In the cord and brain the impulses pass over to the efferent fibers and along these to the blood-vessels, muscles, etc., and these impulses make muscle tissue contract or, if they pass to glandular organs, they make the cells of the glands secrete; an example of this is the flow of saliva that is induced when the nerve endings in the nose (olfactory or sense of smell) and in the tongue are stimulated by the pleasant aroma and flavor of food. Constantly, day and night, but, of course, to a much greater extent in the daytime when the muscles are active, there are impulses passing from the periphery (outer part) of the body to the brain and cord and efferent impulses (aroused by the afferent ones) are as constantly coming out. These impulses help to maintain the muscles in a condition of slight contraction that is known as *tone*. This tone is very important for the well-being of

[1] The nature of nerve impulses, the changes they induce in nerve centers, and the reason for their results are unknown, but, it is believed, every impulse leaves some trace and it is such traces that constitute our memories and the basis for habits.

Fig. 22. Arrangement of wraps to keep a patient warm when she is in a chair.

the body, for examples: (1) **Tone is necessary for** the prompt and smooth action of the skeletal muscles (the muscles covering the skeleton and moving the bones); (2) it is essential for the circulation of the blood for, if the tone of the muscle tissue in the blood-vessels is diminished, the vessels relax and cannot then force the blood through the body properly, in fact, if their tone is greatly decreased, death will result; (3) tone is necessary for the normal action of internal organs that contain muscle tissue, as the heart, stomach, intestine, and bladder. One very bad result of imperfect action of the stomach and intestines is that food remains in these organs too long and there, especially in the intestines, undergoes chemical changes which produce substances that are very injurious to the body. It is usually such substances that are chiefly responsible for the headache, sleepiness, and other indispositions that are associated with constipation.

Lack of muscle tone is common whenever ill health exists and, ordinarily, exercise and cold baths tend to increase it and warm and hot baths to reduce it. It is chiefly because of the influence of baths upon this very important body phenomena—*muscle tone*—that this digression from the main subject of the chapter has been made.

Action of cold baths: Cold stimulates the endings of nerve fibers in the skin that are known as *cold-spots* and impulses then go over the fibers to centers in the cord and brain in which the impulses

are transmitted to the muscles and to the muscle tissue of the superficial blood-vessels. These impulses cause muscular contraction and drive much of the blood from the surface of the body to the deeper muscles and internal organs and this increases the chemical reactions that yield heat and energy to the body. When a healthy person leaves the bath, or, even while in it, if exercise is taken, as when swimming, the increased heat produced in the system induces certain reaction[1] effects and blood is forced to the skin which then becomes warm and red, and, because there is more blood in the skin, there is more heat lost from the body[2] and a rise of temperature from the increased heat production is prevented, in fact, if the person has fever, her temperature may be considerably lowered by a cold bath.

A cold bath will also stimulate the portions of the brain that control thought—how many of you have splashed cold water on your face when you have wanted to study after you have become sleepy? As cold stimulates the brain, cold baths should not be taken at bed time by a person who does not go to sleep easily.

Because cold has these effects the practice of

[1] By reaction is meant *action in a contrary direction to that in which advance has already been made.* The physiological processes involved in the reaction to cold are only imperfectly understood and space will not permit of giving the theories; pupils interested, however, will find them under Heat Regulation in almost any book of physiology.

[2] This will be further discussed in Chapter VII.

taking a cold bath daily tends to render a person sturdy and vigorous for, to summarize, a cold bath acts as a nerve stimulant, it improves muscle tone and the circulation of the blood and, by these actions, it increases the chemical reactions upon which the body's nutrition depends and facilitates the removal of waste matter from the body through the bowels, kidneys, and lungs. Also, a daily cold bath lessens a tendency to "taking cold" easily because (1) congestion of the throat and surrounding parts is likely to result from chilling of the body when reaction does not follow and the results of this condition favor the development of the bacteria that cause colds; (2) reaction to cold does not occur readily until the body is trained to respond to this stimulus (cold) in the right way. For all activities of the body that involve coördination of a number of organs are only carried out perfectly after some kind of pathway (the nature of which is unknown) is formed through nerve centers, and such a pathway, whether it is for absolutely involuntary activity (as the response to cold) or for voluntary acts (*e. g.*, learning to swim), is made only by repetition. Therefore, the person who is not accustomed to cold baths is likely to shiver for quite a time after such a bath or when exposed to cold air, and will not have the pleasant sensation of glow, warmth, exhilaration, and mental stimulation that cold gives a person in whose nerve centers the proper pathways have been formed.

There is, however, a certain amount of danger in the use of cold baths when people are ill, because ill health often prevents reaction, and thus cold baths should only be given to the sick by those who have been trained to observe and understand symptoms.

Action of hot baths: A hot bath (*i.e.*, one with a temperature that is more than a few degrees higher than the normal temperature of the body, usually between 103° and 112° F.) will cause (1) free perspiration; (2) muscular relaxation; (3) dilation of blood-vessels; especially those of the skin, and, consequently, the flow of an extra amount of blood to the surface of the body, and (4) as a result of the increased amount of blood at the surface, lessening of congestion if this condition exists. Congestion in internal organs can be relieved even by hot baths that involve but a small portion of the body such as the feet, and for this reason hot foot baths are often given to relieve congestion of the throat, lungs, or other internal organs.

The effects produced by hot baths are of value in many diseases but, even more readily than cold baths, they may also have very bad effects and, for this reason, they should only be given to a sick person by someone who understands the symptoms that may arise.

The chief uses of hot baths by healthy people are: (1) For cleansing; (2) to lessen congestion in the uterus during menstruation, or that following

chilling of the body. In the latter case a hot bath may, by relieving conditions favorable to the action of bacteria, prevent a cold. An important point to remember after taking a hot bath for such purposes is that it is necessary to keep warm, because exposure to cold air, by promoting rapid evaporation of the sweat, may chill the body and increase the internal congestion.

Hot baths should not be taken frequently except when they are necessary for therapeutic purposes for they cause exactly the opposite effects of cold baths and these, it can be realized from what has been said, are not conducive to health. When they are taken for cleansing they should be followed by a cold plunge or spray.

Action of warm baths: A warm bath (*i.e.*, one with a temperature about 99° F.) is ordinarily the best for a cleansing bath and also to lessen fatigue, either muscular or mental. For the latter purpose it is customary to remain lying quietly in the bath for some time, about thirty minutes. The reason for this is that, if the bathroom is quiet and dark, and the water about the same temperature as the skin, the stimulation of superficial nerve endings will be lessened and consequently the amount of impulses passing into nerve centers much decreased and thus the latter have a chance to recuperate. As fewer nerve impulses pass into the centers, fewer come out and the muscles become relaxed.

Taking baths of this kind before going to bed is

often advisable while one is subjected to unusual mental strain of any kind, but a cold bath should be taken in the morning to counteract the effects of the warm one upon muscle tone.

Cleansing Baths

Baths are necessary, even when a person remains in bed all day and does not look dirty, because (1) the perspiration and sebaceous matter[1] discharged upon the surface of the skin from glands in its deeper layer contain organic substances that, if allowed to remain, decompose and give rise to an unpleasant odor and are conducive to irritation of the skin and chafing; (2) bathing stimulates the circulation of blood in the skin and thus aids in the various functions of the latter and lessens any existing tendency to the formation of pressure sores; (3) a bath is refreshing to the majority of people who must remain in bed.

If possible a patient should be bathed daily, preferably about an hour after breakfast or shortly before she is ready to go to sleep at night. A bath should not be given within about an hour after a meal, because, if given properly, it will, for reasons that have been already mentioned, cause an influx of extra blood to the skin and thereby

[1] The sebaceous matter or sebum consists chiefly of oily substances which serve: (1) To keep the skin soft and pliable; (2) to prevent the too rapid evaporation of perspiration; (3) to protect the skin from injury by excessive humidity or dryness of the atmosphere.

Fig. 23. Helping a patient get into bed.

lessen the amount in the stomach and intestines at a time when it is needed by the glands in these organs for the manufacture of the juices required for digestion.

Demonstration 8

Giving a Cleansing Bath to a Person in Bed

Equipment: The doll in bed. A cotton blanket. Something to protect the bed, for examples, a large bath towel, folded sheet, or pad. A bath towel, face towel, and washcloth. A foot-tub and a basin each about one third full of water, the water in the basin should be about 110° F., that in the tub somewhat warmer, about 115° F., to allow for cooling. Manicure utensils.

Procedure: 1. See that the window is closed and that the room is warm.

2. Collect your equipment and arrange the articles where you can reach them easily as you require them.

3. Put two chairs near the foot of the bed.

4. Replace the top bedcovers with the cotton blanket. To do this, if the bath is given before the bed has been made, remove the spread, fold it, and place it where it will not get crushed. Fold the blanket in four and place it across the patient's chest with its ends facing her head. If the patient is well enough she can generally be asked to hold the lower end, if she is not, tuck this end firmly

under her shoulders or the pillow. Then take the upper end between your third and fourth fingers, on either side of, and a little beyond, the patient. Put your other fingers under the covers and your thumb on top and draw the covers down over the foot of the bed and across the backs of the chairs. As the blanket is between your fingers it is drawn over the patient at the same time as the covers are removed, loosen your hold of it as soon as it covers the feet. Raise the foot of the mattress and pull out the covers and separate them so that they will air while the bath is being given.

If the bed has been made it will not be necessary to remove the spread but, so that it will not be crushed, it is well to fold the covers neatly down to the foot of the bed. A method that, after a little practice, allows of this being done very quickly and deftly is as follows: Place the blanket, and take hold of it and the covers, as described in the preceding paragraph, make a fold in the covers about twelve to fourteen inches deep, then, still holding the blanket, and with your thumb on top of the covers, pass your free fingers under the upper edge of the fold and make a second fold. Repeat the procedure until the clothes are as far down as possible to have them without loosening them at the corners, then, either leave them folded[1] and, if they are not below the patient's feet, raise the

[1] The covers are usually left folded if the bed has been made recently but, otherwise, it is well to draw the folds out over a chair as this allows the sheet to air.

latter over the fold, or else draw out the folds, and bring as much of the covers over the backs of the

Fig. 24. Replacing bedcovers with blanket.

chairs as possible without disturbing them at the foot and corners of the mattress.

5. Draw the patient to the side of the bed.

6. Remove the nightgown.

7. Proceed with the bath, washing in following order: Face, ears, neck, arms, hands, chest, abdomen, back, thighs, legs, feet, pubic region. Put the protector under each part before you wash it. While working remember the following points:

(a) Make firm pressure.

(b) Expose only the part that you are washing at the time, and even this much exposure is not usually necessary.

(c) After washing a part, dry it before going farther.

(d) Wash and dry the ears, between the fingers and toes, the axilla, and pubic region particularly well.

(e) Use the water in the basin for the face, neck, arms, and hands.

(f) Before washing a hand place the towel and (on this) basin under it, then soak the washcloth with water and squeeze the water through the fingers; repeat this procedure after washing the hand with soap and then place the hand on the towel, remove the basin, and dry the hand. Treat the other hand in like manner.

(g) If the knees can be flexed and there is no reason why the feet cannot remain in water for a few minutes, put them into the tub before beginning to wash the thighs and legs. To do this: Flex the patient's knees, put the tub on the side of the bed near the feet, under the blanket; place your arm that is nearest the foot of the bed across the tub—see Fig. 26—this prevents the blanket getting into the water; put your free arm under the patient's legs and your hand under her heels; raise the legs and feet; draw the tub under them and lower them into the water. (This, like the rest of the bath, can be done under the blanket.)

To remove the feet: Fold the bath towel and place it on the bed at the far side of the tub; take hold of the feet and tub as before; raise the feet, hold them over the tub for a few seconds until the water stops dripping from them, place them on the

Fig. 25. Washing the hair.

towel; remove the blanket from above the tub; take the tub from the bed; dry the legs and feet.

(h) Turn the patient on her side before washing her back.

8. Cut and clean the finger and toe nails if necessary. Have a towel under them while you are doing so.

9. Remove the upper blanket. To do so, take hold of the upper edges of the bedcovers, draw them up to the foot of the bed, then include the lower end of the blanket in your grasp and draw clothes and blanket upward, take out the blanket.

10. Put on the nightgown.

11. Remove all your equipment and put chairs, etc., in place.

Important points to remember when a convalescent patient takes a tub bath:

1. If a patient has been very ill she should not be allowed to take a tub bath before convalescence is well advanced without the doctor's permission.

2. See that the bathroom is warm before the patient goes to it.

3. Be sure that the patient has everything that she needs for her bath—bath towel, face towel, washcloth, nailbrush, soap, clean clothing if necessary.

4. Fill the tub half-full of water about 96° F., usually not hotter. Let the cold water run into the tub at the same time as the hot. Never run the hot water in first, especially when preparing the

bath for a child, for this has been the cause of many accidents.

5. Do not allow the patient to lock the door nor leave her long alone without speaking to her to ascerstain that she is all right.

6. If, for any reason other than therapeutic purposes, the bath water is above 96° F., do not let the patient remain in it longer than ten minutes. For reason see page 97.

7. As soon as the patient leaves the bathroom, wash the tub and tidy the room.

Care of the Hair

During and after an illness of any severity the hair is likely to fall out and the scalp to become covered with dandruff, and these conditions are favored by lack of care of the hair and scalp.

Dandruff consists of dried sebaceous matter or *sebum* and cells[1] that have become separated from the scalp. The sebum is a fatty substance that is secreted by small glands similar to those in the

[1] The skin, including the scalp, consists of two layers, a thin outer layer (known as the epidermis or cuticle) consisting of dry flattened cells that have been pushed forward from the under layer (the derma) where the production of new cells is constantly taking place. The outer cells of the epidermis are being constantly rubbed off, but, except those of the scalp, they are so minute that, ordinarily, they are not visible. Even those of the scalp, when the latter is in a healthy condition and kept clean, are hardly discernible. The discharge of these cells, however, becomes excessive when conditions arise that interfere with the circulation of blood in the derma.

skin of other parts of the body. The glands discharge their secretion into what is known as the *hair-follicles* (small pockets or inversions in the derma[1] in which the roots of the hair are situated) and it passes out along the shafts of the hairs.[1] It serves, when not in excess, to keep the hair soft and pliable, but excessive secretion and the presence of dandruff are nearly always associated with falling of the hair.[2] The reasons for the excessive secretion are not always discoverable and some physicians consider that some as yet unknown microörganisms may be sometimes the active cause. But, whatever the underlying cause of both the excessive secretion of sebum and shedding of cells that give rise to dandruff and the falling of hair, they are favored by inefficient circulation of the blood in the scalp. **Common causes of poor circulation** are: A thin, tight scalp; nervous-

[1] A hair consists of a small bulbous portion, known as the *root*, and a straight extension, called the *shaft*. There are three layers to a hair, an outer one consisting of flat cells that overlap each other like the tiling of a roof, a middle portion consisting chiefly of elongated cells and of pigment to which the color of the hair is due, and an inner layer of practically spherical cells. The cells of the shaft grow out from the root and the root absorbs nourishment from the lymph that comes from the blood-vessels in the derma.

The hairs, as can be seen from the above description, are not tubes, as is very commonly supposed, and thus there is no foundation for the very prevalent idea that the ends of the hair should be singed after being cut to prevent the escape of oil and nutrient material.

[2] It is probably the conditions producing the dandruff, rather than the dandruff, that causes the hair to fall.

ness; general ill health; wearing tightly fitting hats. **Conditions and treatments that favor free circulation of blood** in the scalp and, consequently the nutrition of the hair, are: A thick, loose scalp, brushing the hair thoroughly at least once daily; massaging the scalp and keeping it clean. Some physicians say that tonics are valueless and others that certain ones are of use, especially those containing substances that promote a mild, temporary irritation of the scalp and thus increase the amount of blood around the roots of the hairs for, when any part is irritated, more blood goes to it; this can be seen by the redness that follows rubbing the skin. Also, tonics are of value because their use is associated with massage, and the alcohol which they nearly all contain helps to clean the scalp. **Care of the hair** is particularly important when a person is ill, but is very commonly neglected for fear of tiring the patient. As a matter of fact, if the hair is braided properly in two braids, as described on page 62, its care will necessitate very little, if any, fatigue for the patient. The care should consist in a daily, thorough brushing and moving the scalp by placing the fingers firmly upon it and, keeping them in one place for a few seconds, while moving the scalp back and forth in all directions, then moving them to another part and repeating the procedure until all the scalp has been treated. If the hair becomes oily it should be either washed or given what is sometimes called a *dry cleansing*. The latter is far less tiring than a

regular shampoo. Do not use a fine-toothed comb to remove dandruff, for it only does so temporarily and the pointed prongs scratch the scalp and may cause harmful irritation.

Demonstration 9

Cleaning the Hair

Articles required: 1. Orris root, about one tablespoonful tied in a small piece of gauze.

2. A hair lotion,[1] about ½ ounce in a small glass.
3. A medicine dropper.
4. A comb and a brush with stiff bristles.
5. A little absorbent cotton.
6. Two towels and a safety pin.

Procedure: 1. Put one towel under the patient's head and pin the other around her neck.

[1] A hair lotion commonly used in hospitals when the physician does not prescribe a special tonic is as follows:

R Sodium bicarbonate 150 gm.
Ext. witch hazel
Alcohol 95% } a.a. 835 c.c.
Water

This quantity is, of course, for the stock solution; only about 2 ʒ are used at a time, being poured when needed into a small glass.

If there is dandruff the following prescription is sometimes substituted:

Resorcin 10 gm.
Alcohol 95% 40 c.c.
Water 50 c.c.

2. Undo one braid.

3. Separate a strand of hair, brush it well and then pat it on both sides, and also the scalp around it, with the sack of orris root. Place this strand where it will not get mixed with the remainder of the hair, separate another strand and repeat the procedure, do this until all the unbraided hair has been so treated. Then put a thin layer of absorbent cotton over the brush and press it in with the comb, brush a strand of hair with this (it takes up the orris root and with it oily matter that was on the hair); fill the medicine dropper with lotion and run it along the scalp (squeezing the lotion from it at the same time), where the orris has been removed. Take another strand of hair and repeat the procedure, do this until all the unbraided hair has been treated. Then rebraid this. If the patient is tired leave the other braid until later or even the next day; if she is not too tired, turn her head and repeat the procedure.

Demonstration 10

Washing the Hair with the Patient in Bed

Equipment: 1. Two small rubbers, pieces of old blanket, paper, or bath towels may be substituted.

2. A piece of rubber about a yard wide and long enough to cover the pillow and extend into a basin or foot-tub placed on a chair at the side of the bed.

3. Three face towels and one bath towel.

4. A safety pin.

5. A quart pitcher of hot soap solution (about 110° F.), any good soap can be used, but the liquid green soap used in surgery for cleaning the skin is particularly good, it can be bought at any drug store. Enough soap should be used to make a good lather.

6. A large pitcher of water about 110° F.

7. Something to protect the table if it is likely to be injured by the hot pitchers—a towel or paper will answer the purpose.

Procedure:

Arrange the equipment: Put a protector on the table under the pitchers, place the foot-tub on a chair or stool near the head of the bed at the side at which you will stand while washing the hair, hang one face towel where you can reach it easily.

Draw the patient to the side of the bed and turn her on her side with her back toward you.

Loosen her nightgown at the neck and turn it down.

Double a towel over one edge of a rubber, put these around the neck and pin the towel in such fashion that it will hold the rubber in place.

Move the top pillow from under, but just in front of, the patient's head.

Cover a small rubber with the bath towel and this with the large rubber arranging the latter so that it will extend about twelve inches above, below, and in front of the patient's head.

Put these under the patient's head with the small rubber undermost and covering the pillows; roll up both sides of the large rubber so that it forms a trough with one roll under the patient's neck, have one end covering the near portion of the pillow which was moved, and which serves as a wall for the trough, and the other hanging free over the side of the bed.

Put one corner of a face towel between the patient's face and the roll of rubber and leave the rest of it free to wipe her face with, if necessary, during the shampoo.

Undo the hair and spread it out in the trough.

Draw the chair with the tub into position and put the free end of the trough rubber into this.

Pour the soap solution slowly over the head; turning the latter as required, rub the soap into the scalp and through the hair as you proceed and, occasionally, discontinue pouring while you rub the scalp. When the soap solution is finished, pour some of the water from the large pitcher into the small one—as the latter is more easily handled —and pour this over the head, rubbing the latter with one hand as you do so.

When the soap has all been removed, squeeze the water from the hair, wipe the patient's face, neck, and ears with the towel that you placed under her face, moving back the rubber at this point when you take away the towel; gather the hair into the towel, remove the trough rubber, letting it down into the foot-tub.

The patient's head is then on the bath towel. Dry the hair with this and the face towel.

When the hair is as dry as you can get it, unpin the towel that is around the patient's neck, remove this and the rubber and use the former to replace the bath towel unless it is wet; in such case, use the towel that you hung at the top of the bed.

Fasten the nightgown, place your patient in a comfortable position, spread out her hair to dry. Fan it.

Put everything around the bed in order and remove your equipment.

Foot Baths

As previously stated a foot bath is very frequently used to relieve congestion. It does so because, by dilating the blood-vessels in the feet and legs, it increases the amount of blood in these parts and, therefore, of course, lessens the amount in other parts. Mustard is sometimes added to the water, because, by its irritant action, it increases the effects of the heat.

Demonstration 11

Giving a Foot Bath to a Patient (1) in Bed; (2) Out of Bed

Equipment: 1. A foot-tub half full of water, usually 110° or 115° F.

2. A bath blanket.

3. A bath towel.
4. A face towel.
5. A covered hot-water bag.
6. A bath thermometer.
7. Mustard dissolved in cold water. For an adult, one tablespoonful and, for a child, half a tablespoonful for each gallon (four quarts) of water.

Procedure when the patient is in bed:

Loosen the upper bedcovers at the foot of the bed.

Double the bath blanket lengthwise and then fold it in four with the two ends one on each side of the central fold.

Place this across the foot of the bed, under the loosened covers with the ends toward the foot. Stand near the foot of the bed, take the upper fold of blanket between your third and fourth fingers and the bedcovers between your other fingers and thumbs and turn the covers back to above the knees, carrying up the blanket over the legs at the same time.

Add the dissolved mustard to the water in the bath. The reason why it should not be added sooner will be found on page 183.

Flex the patient's knees.

Turn back the lower portion of the blanket so that it will cover the part of the bed on which the tub is to rest.

Place the tub on the bed, near the feet over the lower fold of blanket.

Put your arm that is nearest the head of the bed under the patient's legs and your hand under her heels.

Put your other arm across the tub, grasping it on the far side, and move it forward into position while, at the same time, you raise the patient's feet

Fig. 26. Foot bath. The blanket has been drawn up to show the manner of holding the feet while putting them into the tub, ordinarily they should not be exposed.

and legs from the bed. This is done under the top layer of blanket, the arm being kept across the tub to prevent the blanket getting into the water.

Before lowering the feet into the water, tell the patient that it is hot, but that it cannot possibly burn her. Put the feet in slowly and, if the patient objects to the heat, raise and lower them alternately for a short time until she becomes accustomed to it.

Put the edge of a folded towel between the

patient's legs and the rim of tub; be sure that it is not near the water.

Take hold of the upper edge of the blanket and hold it in position, while with your other hand you draw down the covers.

Roll the hot-water bag in the bath towel (to warm the latter) and place it under the covers.

The feet are kept in the water for from twenty to thirty minutes. If it is necessary to raise the temperature of the water, bring some water that is about 150° F., in a pitcher, and pour it in slowly, keeping your hand between the patient's legs and the stream. This can be done without uncovering the tub except at the point where you are pouring in the water.

To remove the tub: Turn the bedcovers back above the knees, but leave the blanket covering the legs. Take the bath towel from the hot-water bag and place it on the far side of the tub. Take the towel from behind the patient's legs.

Put your arm under the legs as when putting them in the tub, raise them from the water and hold them over the tub for a few seconds, that the water may drain from them, then put one side of the layer of blanket that is covering them around them and lower the feet on the bath towel.

Remove the tub. Dry the feet and then remove the blanket from underneath them.

Put the hot-water bag at the feet.

Draw down the covers and, with them, the

blanket. Remove the latter and tuck the covers under the mattress as usual.

Procedure when the patient is not in bed:

Provide a comfortable chair and over the outer edge of the seat and the floor spread a heavy colored blanket.

Have the patient sit on the chair, remove her shoes and stockings and turn her skirts up above her knees.

Put the tub in position, place the patient's feet in the water and envelop her legs and the tub with the blanket.

Add hot water, if necessary, in the same manner as when the bath is given in bed.

After about twenty minutes, remove the bath and dry the feet thoroughly.

CHAPTER VII

Temperature. Pulse. Respiration. Records

Heat production, elimination, and regulation. Fever. Nature and care of thermometers. Demonstration 12: Procedure in taking the temperature. The nature of the pulse. Conditions that cause changes in the rate and character of the pulse. The nature of respiration and of breathing. Factors controlling these functions. Demonstration 13: Counting the pulse and breathing. Some important reasons for keeping records of a patient's condition. Nature of records.

The equipment for Demonstration 12 is listed on page 125 and that for Demonstration 13 on page 136.

Heat Regulation

Temperature has been defined as *the degree of hotness of a body measured by a chosen standard.*

In referring to measurements of heat two expressions are used, viz., amount and degree. An example of the difference between the two measurements is as follows: The temperature of eight ounces of boiling water is the same as that of two thousand ounces of boiling water, but there is a much larger amount of heat in the vessel holding the two thousand ounces than in that containing the eight ounces. The degree of heat is ascertained

with a thermometer and recorded in degrees; the amount of heat is ascertained by the use of a calorimeter and recorded in calories. Unfortunately, two standards are used and expressed in terms of calories. In Physics, the calory is said to be *the amount of heat necessary to raise the temperature of a gram of water one degree centigrade* and in Physiology and Dietetics a Calory is considered as *the amount of heat required to raise the temperature of a kilogram of water one degree centigrade.* The former is sometimes termed the small calory and the latter the large calory and a capital C is commonly used when the large Calory is referred to.

The amount of heat produced in the human body varies considerably under different circumstances, but, nevertheless, there is very little fluctuation in the degree of heat (commonly designated the temperature) of a healthy individual. The reason for this is that the body is provided with a mechanism to control the rate of heat production and elimination. The details of the action of this mechanism are as yet but imperfectly understood but, experiments seem to show, that there are small masses of gray matter in the brain that are influenced by the temperature of the blood as it passes through them and, as the result of this influence, send impulses to nerve centers controlling organs that influence heat production and elimination. The portions of gray matter that are affected by the temperature of the blood are termed *heat regulating centers.*

Heat is produced chiefly in the muscles as the result of the oxidation[1] of substances derived from food. The amount of material oxidized depends largely upon the amount of muscular contraction that occurs and thus oxidation goes on more rapidly and, consequently, more heat is produced when a person is active, than when at rest, and convulsions, which consist of intense muscular contraction may cause a very excessive rise of temperature. The underlying reasons for the increase of oxidation by muscular contractions are unknown. **Very important requisites for the maintenance of oxidation** in the tissues are certain chemical substances manufactured by special glands and brought to the tissues by the blood. Thus, it may be said, that **the chief requisites for the maintenance of body heat are** food, oxygen, and chemical substances that promote oxidation, and **the rate of oxidation is chiefly dependent upon** the amount of muscular contraction that occurs.[2] **Other less important sources of body heat are:**

[1] The union of oxygen with matter. When oxygen unites with a compound it decomposes it into simpler substances and liberates the energy (power to do work) that held its molecules together. Some of this energy is manifest in the form of heat. The muscles, heart, and lungs and other organs of the body are just as dependent upon the energy thus liberated for their power to do work as the machinery of a ship is upon the energy liberated from the coal burned in its furnace. When oxidation takes place rapidly enough to induce fire it is spoken of as burning or combustion.

[2] Some physiologists consider that there may be differences either in the amount or nature of the chemical substances promoting oxidation that also determine the rate of its occurrence.

The friction within the body caused by the movements of the muscles, circulation of the blood, and other internal activities; the hot foods and drinks that are taken; the heat received from such external sources as the sun and fires.

Heat is lost from the body chiefly through the skin but also, to a slight extent, through the lungs and with the urine and feces. Its loss through the skin is affected by conduction and radiation and by the evaporation of sweat. **The amount lost by conduction and radiation depends chiefly upon** (1) the amount of blood near the surface of the body, being greater, of course, when there is a large amount of blood in the skin vessels; (2) the temperature of the environment, hot surroundings interfere with the passage of heat from the body (the reasons for this were given in Chapter I), and cold, by contracting the superficial muscles and blood-vessels, forces much of the blood to the interior of the body. **Loss of heat by evaporation of sweat** occurs because heat is essential for evaporation and that required is taken from the body. 536 small calories or 0.536 of a large Calory are necessary for the evaporation of one gram of water and approximately nine hundred (about one quart) grams of perspiration are secreted daily.

Ordinarily we are unconscious of this secretion because the rate of evaporation keeps pace with that of secretion and, on a hot day, if the humidity is not high, a much larger quantity can be secreted without becoming visible or being felt, because

heat hastens evaporation, but, humidity interferes with evaporation (for reason given in Chapter I) and, consequently, with loss of the heat from the body by evaporation.

The heat lost through the lungs also is largely due to its use for vaporization, for during twenty-four hours as much as a pint of water leaves the body as vapor in the breath.

To summarize the process of heat regulation: Cold causes muscular contraction, drives the blood from the surface of the body, and lessens perspiration; thereby, it increases heat production and lessens heat loss. When the temperature of the blood is raised, either as the result of increased oxidation or from hot surroundings, the skin vessels dilate and more blood flows to the exterior, the secretion of perspiration is stimulated and the muscles relax; therefore, loss of heat is promoted and its production decreased. Consequently, the temperature of a healthy person remains normal, regardless of changes in the external temperature,[1] unless the change is excessive.

Fever

Fever is defined *as abnormally high body temperature.* The rise of temperature is brought about by

[1] The body temperature of some of the lower forms of animal life varies with that of their environment; thus a frog's temperature in winter may be five degrees centigrade and in summer twenty-five degrees centigrade or over and the vitality of its tissues will not be impaired by this wide fluctuation. In higher forms of animal life, however, such a fluctuation would be incompatible with life.

disturbance between the production and loss of heat. The nature of this disturbance varies somewhat as in some cases it is due chiefly to over production and in others to interference with loss of heat. This derangement in heat regulation, however, only lasts for a short time for the heat regulating center eventually again assumes control but, as long as there is fever, the center is set for a higher scale of temperature so that, instead of responding to a temperature between 99° and 100° F. (the ordinary actual temperature of the blood), it is only called into action by a higher temperature,[1] the degree depending upon the cause of the fever and the patient's condition, but, even in fever there is adjustment. This is much less stable, however, than in health for there are often wider variations in the diurnal fluctuations and changes of external temperature and other stimuli more easily depress or increase the temperature than in health.

The cause for the heat-regulative upset is not definitely known; one of the theories that has been advanced is that the heat centers are depressed by

[1] The heat regulating center is often likened to the adjustor of an electric oven. If the indicator of the adjustor is set, for example, at ninety-eight, so soon as the oven reaches ninety-eight degrees the electric connection is automatically severed by the adjustor and remains so until the temperature falls, when it is again remade by the adjustor, and thus a constant temperature of ninety-eight is maintained in the oven; but if the indicator is set for, say, four hundred, this will be the temperature maintained in the oven.

the action upon them of bacterial toxins, or in non-bacterial diseases, the conditions causing the illness; but it is now thought that there are also other factors involved; these, however, are too complicated to be discussed here.

Fever, though a symptom of abnormal body conditions, is now thought to be one of nature's methods of protecting the body from such conditions. An experiment that has been tried repeatedly has consisted in putting rabbits, or other small animals, into hot surroundings until their temperature rose to about 40° C. and then injecting them, and also similar animals that had not been heated, with bacterial toxins. In almost all instances all the animals that were not heated have shown bad results and died from the effects of the toxins before those who had the high temperature at the time of injection. Nevertheless, fever can become so high that it will add to the danger of the patient's condition.

The toxins produced by the various species of bacteria and diverse abnormal body conditions differ one from the other and they induce different conditions or symptoms in the body, including the course of the temperature, and therefore knowledge of the changes in the temperature helps the doctor to decide what is the matter with the patient and the progress of the disease.

The terms used in describing different degrees of temperature are shown in the following table:

	Fahrenheit	Centigrade
Hyperpyrexia	106° and over	41°
High fever	103° – 106°	39° –41°
Moderate fever	101° – 103°	38° –39°
Subfebrile	99° – 101°	37° –38°
Normal	98° – 99°	36.5°–37°
Subnormal	96° – 97°	35.5°–36°
Collapse	95° – 96°	35° –35.5°
Algid collapse	Below 95°	Below 35°.

Nature and Care of Thermometers

The thermometers used for ascertaining the body temperature are known as *clinical*[1] *thermometers*. A clinical thermometer consists of a glass tube of capillary[2] bore with a bulb, filled with mercury, on one end. When a thermometer is made the bulb and part of the tube are filled with mercury and the instrument is heated until the mercury boils over and thus forces the air from the tube. The open end of the tube is then sealed. When the tube is cold it is placed in boiling water and the point to which the mercury rises is marked 212, if the thermometer is to be marked according to the Fahrenheit scale, or 100, for the centigrade scale. The bulb is next placed in a vessel of melting ice and the point at which the mercury stops is marked 32 for the Fahrenheit scale and 0 for the centigrade. The space between the boiling and freezing temperatures is then marked at regular intervals, the number and size of the divisions made

[1] From a Greek word signifying *at the bedside*.
[2] From the Latin *capillaris* = hair-like.

depending upon which scale is used. The value of the thermometer depends upon the expansion of the mercury by heat which causes it to rise in the tube and, as the expansion is always in proportion to the degree of heat, to which the mercury is subjected, the height to which it rises in the tube shows the temperature.

When not in use a thermometer is best kept in a case but, when it is being used for a patient, it is more hygienic to keep it in a glass of water or, if the patient has an infectious disease or the thermometer is used for more than one person, in a disinfectant. A pad of soft material, as cotton, gauze, or muslin, should be kept in the bottom of the glass, because the bulb is likely to be broken if it comes in contact with anything hard. The glass should be kept covered with a compress of gauze or muslin and the thermometer wiped on this before use. A thermometer should be well washed with alcohol or other disinfectant before it is returned to its case.

Clinical thermometers are self-registering—*i. e.*, the mercury stays at the height to which it ascends until it is shaken down. Therefore, before using a thermometer, it is necessary to see if the mercury is down to 95° F. and if not to shake it down to that point.

To shake down the mercury, hold the thermometer between the thumb and the first and second fingers of the right hand, with the bulb pointing downward, flex the hand somewhat and give it a

quick, sharp jerk. Be careful not to shake the mercury below 95° for if it all gets into the bulb it may not be possible to make it rise again. To try and make it do so, put the bulb into water about 108° F.

The temperature is taken in either the mouth, rectum, or axilla, for these locations form more or less closed cavities in which large blood-vessels approach the surface. For obvious reasons, the temperature taken by rectum will be registered about a degree higher, and that taken by axilla about ½ degree lower, than that taken by mouth. It is necessary to leave the thermometer in place for a longer time when it is put in the axilla than when it is inserted in the rectum or mouth.

There is less chance of error when the temperature is taken by rectum and thus it usually is taken in this way when a patient is very ill, except when there are abnormal conditions of the rectum; also the temperature of a young child is best taken in this way. As this will probably be the only rectal temperature that the students of this class will be likely to take, unless they receive further instruction, it will be described in the chapter dealing with the care of children.

Demonstration 12

Taking the Temperature by Mouth and by Axilla

Equipment: 1. Clinical thermometers in a glass containing a disinfectant and a soft pad in the bottom.

2. Several small pieces of soft, clean muslin or gauze on which to wipe the thermometers.

3. A few towels.

4. A clock or watches.

5. Pad on which to record the temperature.

6. Pens.

Procedure when taking the temperature by mouth: Take the thermometer from the solution, wipe it, shake it down if necessary, as described on page 124, place it, in a slanting position, under the tongue. Tell the patient to keep her mouth tightly closed. Leave it in place three minutes. Remove it, wipe it, read it, put it in the solution.

Record the temperature.

Points to remember: A mouth temperature should not be taken within ten minutes of the time that the patient has had anything hot or cold in the mouth.

The temperature is not to be taken by mouth when the patient is coughing, has dyspnea, is unconscious, delirious, insane, or too young to understand what she is to do.

Do not leave the thermometer in the mouth longer than three minutes.

Should a patient bite the bulb off the thermometer, make her at once spit out the glass and mercury and be sure that no particles are left in her mouth. The physician should be notified. The danger attending this accident is that small particles of glass may be swallowed. Mercury in its

metallic form is inert and, therefore, would probably do no harm, even if swallowed, but white of egg, which contains albumen, the chemical antidote for mercury, is usually given as a precautionary measure.

Procedure in taking the temperature by axilla: Wipe the axilla with a towel. Shake down the mercury.

Place the bulb of the thermometer in the hollow of the axilla with the stem pointing toward the chest, bring the arm across the chest, and instruct the patient to hold it pressed closely to her body; unless she can do so without undue effort, keep your hand upon her arm.

Remove, wipe, and read the thermometer, put it in the disinfectant, and record the temperature at once.

Pulse

By the pulse is meant the distention of the arteries that occurs when blood is pumped into them from the heart.

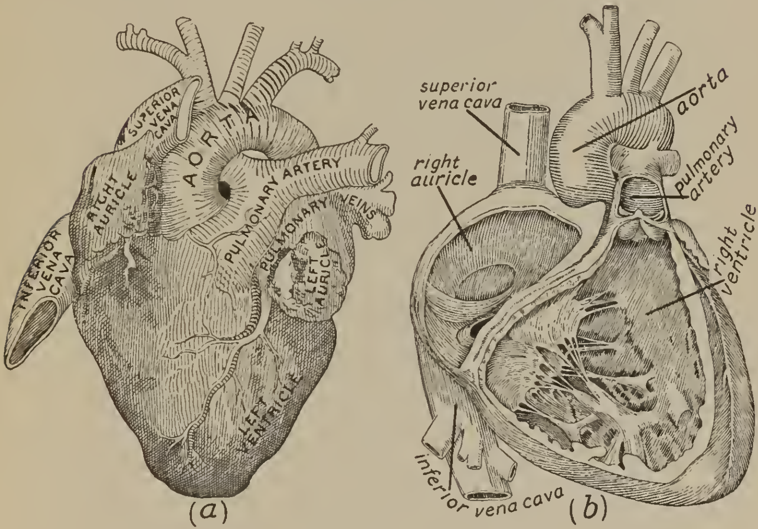
This distention or pulsation may be felt whereever an artery approaches the surface of the body over a bone, the latter is necessary to afford a firm background against which to make pressure. For convenience, however, the pulse is usually counted on the radial artery[1] where it comes near the surface at the wrist.

[1] The large artery on the thumb side of the forearm.

There are a number of things that a nurse is taught to observe when "taking the pulse," but as to be able to recognize most of them, requires considerable experience with sick people, the rate and force or strength will be the only ones discussed here. To understand even these it is necessary to know the following facts regarding the structure of the heart and functions of the blood-vessels:

The heart is a hollow muscular organ with a muscular wall dividing its interior into two distinct cavities and each of these two cavities is separated by movable flaps of membrane, known as *valves*, which open when blood is flowing from the upper to the lower divisions. The upper divisions, *i. e.*, the part above the valves, on each side of the heart, are known as the *right* and *left auricles*, and the divisions below the valves as the *right* and *left ventricles*. The blood enters the auricles from six large veins, two of which open into the right auricle and four into the left. The blood entering the right auricle has come from all parts of the body to which it has given much of its oxygen and from which it has received carbon dioxid and other waste matter. That entering the left auricle has come from the lungs, where it has given up a large proportion of carbon dioxid and received oxygen. From the auricles, the blood flows into the ventricles and from the right ventricle it is forced into the pulmonary artery from which branches extend to the lungs, and from the left ventricle it is forced

into the large artery known as the *aorta* from which branches extend to all parts of the body. Thus, to summarize, the blood flows from the left auricle into the left ventricle, from the left ventricle



EXTERIOR INTERIOR OF RIGHT SIDE

Fig. 27. The Heart. Showing cavities of the right auricle and right ventricle.

into the aorta, and thence all over the body; from arteries the blood passes into capillaries and from these into veins, and veins in all parts of the body communicate directly or indirectly with one or other of the two large veins that enter into the right auricle. From this the blood is poured into the right ventricle and, at the same time as the blood in the left ventricle is being forced into the

aorta, that in the right is forced into the pulmonary artery from which it flows to the lungs to get rid of carbon dioxid and obtain a fresh supply of oxygen for the body. From the lungs it is returned to the left auricle.

From the time that the organs concerned with the circulation of the blood[1] are formed,[2] until death, the heart is constantly alternately contracting and relaxing with a very short period of rest[3] between the relaxing and subsequent contraction. When the heart is beating more rapidly than usual it is chiefly the rest period and time of relaxing that are shortened. Thus when the pulse is abnormally rapid, the heart is losing its rest and also its nutriment, for the heart muscle gets its blood supply from small vessels that run through its substance and these, like the cavities, are emptied when the heart contracts.

The normal rate of the heart can be seen by the following table. As shown there, sex and age are responsible for a certain amount of difference.

In men....................	60– 70	beats	per	minute
" women..................	65– 80	"	"	"
" children above 7 yrs......	72– 90	"	"	"
" children 1–7 yrs..........	80–120	"	"	"
" infants..................	110–130	"	"	"
At birth...................	130–160	"	"	"

[1] Heart, arteries, capillaries, veins.

[2] Some months before birth.

[3] About 0.1 to 0.2 of a second when the pulse rate is 72 per minute.

The rate of the heart action is controlled by impulses coming from the brain over two different sets of nerve fibers and when one of these, known as the *cardiac*[1] *accelerator*, is stimulated, it makes the heart beat faster while stimulation of the other group, known as the *cardiac inhibitory mechanism*, slows the heart action.

Some of the common causes of stimulation of the accelerator mechanism and, consequently, of increase in the rate of the pulse are: Fear, anger, excitement, or any other strong emotion, bodily activity, fever. The rate of the pulse is also increased by depression of the inhibitory mechanism and by conditions that prevent the heart contracting firmly, such as a diseased or weakened heart, relaxed blood-vessels, a deficiency of blood in the vessels, such as is the case after hemorrhage or when the blood-vessels become so relaxed that the arteries do not force enough blood onward through the capillaries and veins to the heart. Also a person's position, lying, sitting, standing, causes some change in the pulse rate, partly because in the two postures last mentioned the blood has to be forced to the parts above the heart against gravity. Even in health, the pulse may be as much as five beats more per second when a person is sitting up than when lying down and thus a patient's heart may be spared at least 21.600 beats a day if she is kept lying quietly in bed. This is very important when the heart is beating too

[1] From the Greek, *kardia* = the heart.

rapidly and thereby losing its chance to get sufficient rest and nutriment.

For two reasons it is very important to remember that excitement increases the heart rate (1) in order to realize the importance of shielding the patient from undue excitement and annoyance; (2) to appreciate that if a patient's pulse is counted while she is excited the count will not show the ordinary rate of the heart action at the time, and, as relative changes in temperature and pulse are an important guide to the physician in judging of a patient's condition, when there is any known cause for increase in the pulse rate at the time it is counted the fact should be stated.

Breathing and Respiration

By breathing is meant the movements of the chest walls, diaphragm, and lungs which result in the inspiration of fresh air and expiration of that not used and, with it, the gases brought from the tissues to the lungs by the blood.

Respiration[1] implies (1) the interchange of gases that takes place in the lungs—this is known as external respiration—and consists in the passage of oxygen from the inspired air into the blood and its union there with what is known as *hemoglobin* (which is contained in the red corpuscles[2]) and the

[1] This is now considered the correct significance of the term respiration, but the word is very commonly used as a synonym for breathing.

[2] If not understood, see footnote on page 135.

passage of water and carbon dioxid from the blood into the air sacs[1] of the lungs from which it is expelled in expiration; (2) the interchange of gases between the blood and the tissues (known as internal respiration) in which oxygen leaves the blood and passes into the tissues and carbon dioxid passes from the tissues into the blood.

The principal factor maintaining breathing is the carbon dioxid in the blood which stimulates a small mass of gray matter contained in a portion of the brain known as the *medulla oblongata.* This is connected by nerve fibers with the spinal cord from which fibers extend to the muscle tissue of the diaphragm[2] and to muscles of the chest. It is stimulated by the carbon dioxid in the blood passing through it and the impulses thus evoked contract the muscles involved in breathing and, as a consequence, the diaphragm is pulled downward in the center and the ribs are pulled upward and outward, thus the chest cavity is very considerably

[1] The lungs consist chiefly of air-passages which end in minute sacs of exceedingly thin membrane, and of blood-vessels held together with a very thin, elastic fibrous tissue. The walls of the air sacs and of the capillaries upon their surface are exceedingly thin and gases can pass through them readily. At the rate at which the blood ordinarily flows through the body it takes less than a minute for the entire amount of blood in the body to flow to and through the lungs.

[2] The dome-shaped partition between the thoracic (chest) and abdominal cavities. Its central portion consists of non-contractile fibrous tissue and this is surrounded with muscle that is attached to the ribs, vertebræ, etc., forming the lower boundary of the thoracic framework. See Fig. 28.

enlarged and, as the lungs expand in keeping with the chest wall, there is a partial vacuum created in the air passages and sacs which the outside air is pressed in to fill. This constitutes what is known

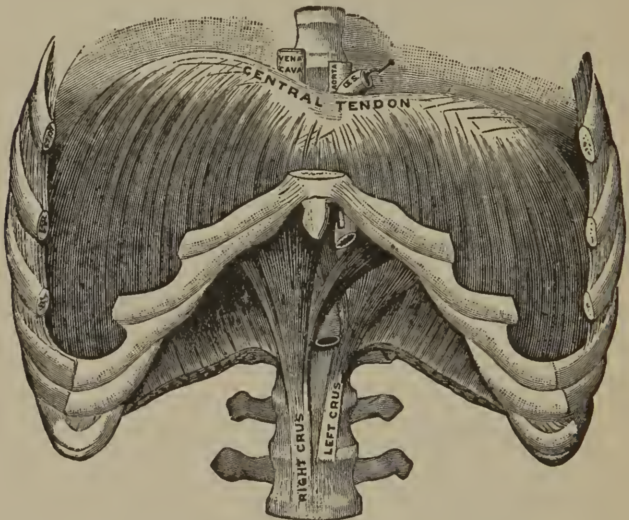


Fig. 28. Diaphragm, viewed from the front. (Gerrish.) The ribs have been cut away in front.

as *inspiration*. It is, as stated above, followed by the recoil of the muscles involved and relative compression of the lungs which constitute *expiration*. When anything interferes with the normal aëration of the blood, more muscles are brought into play than are used in ordinary breathing and expiration has a more forceful character.

The rate of breathing can be controlled for a

few minutes by voluntary effort, but not for long. It is determined chiefly by the amount of carbon dioxid in the blood and, therefore, it will be increased by anything that accelerates the oxidation in the tissues, and also by anything that tends to hinder the blood getting its required amount of oxygen, and getting rid of surplus carbon dioxid. Such interference with the proper aëration of the blood may result from[1] any congestion or obstruction in the lungs or the upper air passages leading to them; (2) a lack of red corpuscles or of hemoglobin in the blood[2]; (3) interference with the circulation of the blood in the lungs as may occur when the heart is diseased or the nervous system is depressed.

Also, *the depth of breathing movements* influences their rate, relatively slow movements being associated with deep breathing and rapid movements with shallow inspirations. Common causes of shallow breathing are: Thoracic or abdominal pain, lack of oxygen in the room, reduced air pressure (as in high mountains), tight clothing, and habit, the latter being probably often the result of tight clothing or of a lazy disposition.

[1] The coloring matter in the red blood corpuscles.

[2] The body's oxygen supply is very greatly influenced by the amount of hemoglobin in the blood and by atmospheric pressure, and, when people go up high mountains, they are likely to suffer from *air-hunger* for the first few days. Usually, however, this stimulates the formation of hemoglobin and thus more oxygen can be absorbed at the low atmospheric pressure. This stimulation of hemoglobin formation is largely responsible for the benefit anemic people gain by sojourn in the mountains.

As the rate of breathing is increased when it is shallow, if there is nothing to interfere with the aëration of the blood, as much oxygen will be obtained with superficial as with deep breathing but, nevertheless, the former is not thought to be as conducive to good health because the lower areas of the lungs are not expanded as they should be and, as the circulation of blood in the lungs is helped by the respiratory movements, the unexpanded areas are not properly nourished and thus are less able to resist invasion by bacteria.

As can be seen by the following table which shows the average normal frequency of breathing there is some difference in the rate that is normal for children and adults and men and women, the latter difference however is thought to be largely due to dissimilarity in dress.

Men....................	16 to 18 per	minute
Women..................	18 to 20 "	"
Children................	20 to 25 "	"
Infants..................	30 to 35 "	"

Demonstration 13

Counting the Pulse and Breathing

Articles required: 1. Watches with second hands.

2. Writing pads and pens.

The pupils can act as subjects for each other.

Precautions: Do not "take the pulse" when the patient is excited or other conditions exist which

Fig. 29. Counting the pulse and breathing.

will cause temporary changes in it, except for the purpose of noting the results of such conditions upon it, see page 132.

Do not use your thumb to feel a patient's pulse for there is a superficial artery in it and you might feel your own pulse instead of the patient's.

Do not make too strong pressure when counting the pulse for, if the pulsation is weak, strong pressure will obliterate it—this is a common fault of beginners.

When taking the pulse at the radial artery, let the patient's arm rest on the bed or a table.

When taking the pulse of a patient for the first time always take it in both wrists to ascertain if it can be felt equally well in both for, sometimes, owing to an unusual distribution of the arteries, or of some pathological condition, there is an appreciable difference in the quality of the pulsations in the two arteries.

The method and frequency of breathing can be, to some extent, controlled voluntarily and sometimes, possibly without intention, it will be done when the individual knows that her breathing is being counted; therefore, do it, if possible, without the patient's knowledge. A good way of doing so is to count the breathing either before or after the pulse and to pretend to be counting the latter while you are counting the breathing movements. When the patient is in bed her hand may be held as shown in Fig. 29, for the chest movements can then be felt as well as seen which facilitates counting them.

Procedure when "counting the pulse": See that the patient is resting comfortably.

Take your watch in one hand and place two or three fingers over the artery, making slight pressure; observe the general character of the pulse. Count the number of beats occurring in one minute.

Procedure when counting the breathing: Place your fingers as when counting the pulse, hold your watch where you can see its second hand and the patient's chest at the same time. Count an inspiration and expiration as one breath. Count for one minute.

Records

When a person is at all seriously ill a written record should be kept, for otherwise something that the doctor should be told at the time of his visit will be forgotten. **The record should include:** The doctor's orders; records of the patient's temperature, pulse, and breathing; the hours at which medicines are given and the amounts administered; pain or other distress that the patient complains of and the results of treatments used for relief; the number of bowel movements.

CHAPTER VIII

Medication. External Applications. Irrigations

Method of administering drugs. Bad effects that may arise from the unadvisable use of drugs. Important points to be remembered regarding the care and administration of drugs. Measuring medicines. Application of medication to the nose, throat, ears, eyes, and skin. Demonstrations 14 to 21, including: Measuring medicines; application of medication to the throat and steam inhalations; irrigation of the ear; application of medicine to the eyes; making poultices and sinapisms; applying ointment, liniments, iodine, fomentations, hot-water bags and substitutes, ice-caps and substitutes. The nature and uses of counter-irritants.

The lists of equipments for the demonstrations are on pages 145, 154, 162, 167, 175, 182, and 192.

Medicinal substances are used to cause both local and general or systemic effects.[1] For local effects they must be so applied that they will come in contact with the part that they are to act upon; for systemic effects they must be either absorbed by the blood or act upon nerve endings and thus obtain results through the nervous system as described under counter-irritation.

[1] Those acting upon the whole body or at least a number of organs, especially those concerned in a common function.

Drugs may be given: by mouth; through the lungs; by rectum; as subcutaneous, intramuscular, and intravenous injections; and they may be applied externally; but only the means of giving them by mouth and applying them externally will be considered here, because the other methods of administration require more knowledge and practice than can be gained in a short nursing course.

Before learning how to administer medicines it is well to realize that drugs should neither be taken nor given inconsiderately because there is hardly a drug that has not some bad effect. This is true even of drugs that are very commonly taken without consulting a physician, viz., drugs used to relieve headache and to induce sleep, cathartics, and tonics. Other reasons why it is unwise to take even such drugs frequently without consulting a doctor are: (1) the symptoms that the drugs are taken to relieve may be due to serious conditions and, though a drug may temporarily relieve the pain or discomfort that the condition produces, it does not cure the cause and this may continue to grow worse. For example, common causes of frequent headache are: (a) Abnormal conditions of the eyes; (b) collections of pus in bones behind or at the side of the nose, or at the roots of the teeth, or in the tonsils; (c) constipation; (d) disease of the kidneys; and the drugs commonly taken to relieve headache cannot improve such conditions though, usually by depressing the nervous system and thus lessening the appreciation of pain, they

may alleviate the headache. (2) A number of the drugs which alleviate pain (including headache) and induce sleep do so by uniting with constituents of the nerve tissue, especially that of the brain, and, if they are used frequently they may cause deterioration of the tissue, and the person's mental capabilities and will-power will then decline, and any or all of the organs of the body may cease to function properly, because, as previously stated, their functioning is controlled by the nervous system. Even cathartics and tonics, if taken too frequently, may cause trouble. Cathartics so accustom the intestine to abnormal irritation that the contraction of its muscle tissue, which propels the waste from food through the organ, does not occur properly without the extra stimulus. Therefore, taking cathartics too frequently may be a cause of chronic constipation. Thus it is infinitely better to try and overcome any tendency to constipation by natural means,[1] *e. g.*, eating food that has a considerable amount of cellulose[2] which is not digested, *e. g.*, fruit and green vegetables. The food supply should also be considered when a tonic

[1] Constipation, when not due to intestinal disease, is generally the result of (1) a diet lacking in substances that are not digested and thus provide the bulk necessary to stimulate and distend the intestine and thereby produce the nerve impulses that induce defecation; (2) lack of tone of the intestinal or abdominal muscles, see page 93; (3) failure to respond to the sensation arising when the rectum is ready to discharge its contents, this is further described on page 216.

[2] The fibrous part of vegetables, fruit, and grain.

seems needed, for fresh vegetables, fruit, eggs, and milk contain many of the constituents of tonics and have not the bad effects of drugs. Dried and most canned vegetables and fruit are not as good as fresh, because the means taken to preserve them destroys some of their vital principles.

Some important points to remember regarding the care and administration of medicines are:

1. Never leave medicines where children can get them.

2. Do not keep highly poisonous drugs, such as disinfectants, on the same shelf as others unless the bottles are of very different size.

3. Never have medicines in unmarked bottles.

4. Keep oils in a cold place.

5. Do not use a drug that has been kept for any length of time if its appearance is at all changed, for many drugs deteriorate with age.

6. Give medicines on time and be especially particular about the relative time of meals and medicine because, for examples, some drugs that are ordered given before meals are to induce the secretion of gastric juice and, for various reasons, may be about useless if given while the stomach is full of food or if it contains acid, as it does during digestion; on the other hand many of the drugs ordered to be given after meals would be exceedingly irritating to the lining of the stomach if the latter were empty.

7. Use graduated glasses and pipettes (medicine droppers) not spoons for measuring medicines,

for few of the latter are of standard size and quite a number of medicines will stain metal.

8. Measure exactly, never give a patient a drop more or less than the doctor orders.

9. If there is more than one medicine on hand, read the label on the bottle twice, before and again after pouring the drug.

10. Shake the bottle before pouring out a medicine that is not perfectly clear or that has a sediment.

11. While pouring a medicine, hold the glass with the mark of the quantity required on a level with your eye; if the mark is above your eye, you will give too little, if below, too much.

12. To avoid defacing the label on a bottle while pouring the medicine, hold the bottle so that the label will be on the upper side, but do not let your hand come in contact with it, and, before putting away the bottle, be sure that there are no drops on the rim.

13. Always recork a bottle immediately after pouring out the drug for many medicines contain volatile substances and may thus become either stronger or weaker if left uncorked.

14. Always follow the instruction regarding the dilution of drugs, because some drugs are very irritating and may do great harm to the membrane lining of the stomach and intestine if not very well diluted, while the effect of others will be minimized if much water or other diluent is added to them; certain medicines, especially syrup cough mixtures

are not to be diluted at all for the syrup lubricates the irritated membrane of the throat.

15. A certain class of drugs, known as bitters, produce their effect (stimulation of the appetite and secretion of saliva and gastric juice) by virtue of their bitter taste and thus nothing should be done to alter this further than diluting the drug with cold water. Other drugs, however, should be made as palatable as possible. Powders and also liquid preparations of which only a small amount is ordered can be given in capsules or, especially for children, in syrup or jam. Castor oil[1] is probably the medicine that has most frequently to have its taste disguised and a good way of doing this is to put some lemon or orange juice and a small piece of ice in a medicine glass, add the oil and then some more fruit juice and, just before the patient is ready to drink it, some Vichy or other effervescing water. The piece of ice should be about the size of a pea when the patient takes the dose, that is it must be small enough to swallow easily. Have a glass of lemonade or orangeade ready for the patient to take as soon as she swallows the oil. Some people object to the mineral oils which are now much used as cathartics, and for those who do, it is well to add a little lemon or orange juice or peppermint water or some flavoring extract. Holding a small piece of ice in the mouth before taking a distasteful dose

[1] N.B. Never give castor oil in milk, especially to children, for it may cause the recipient to dislike milk.

may be of help for cold depresses the taste nerve endings.

16. Give acids and medicines containing iron through a tube, because acids may corrode and iron discolor the teeth. The mouth should be thoroughly rinsed after taking such medicines.

Demonstration 14

Measuring Medicine

Equipment: 1. Ordinary graduated medicine glasses, minim glasses, medicine droppers (pipettes).

2. A pitcher of ice water.

3. Some bottles of water or other substitute to represent medicine.

4. Small trays.

5. Small pieces of old, clean muslin or gauze.

Procedure: Take a medicine glass in the left hand and (after reading the label), the medicine bottle in the right.

Shake the bottle if necessary.

Take the cork between the third and fourth fingers of the left hand and hold it thus (with the part that goes in the bottle projecting from behind the hand) while you pour out the medicine.

Raise the glass until the mark representing the

amount of drug that is to be given is on a level with your eyes.

Pour in the drug until it is on a line with this mark.

Put the glass on the tray.

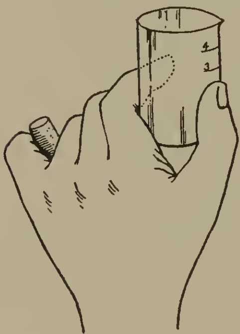


Fig. 30. Method of holding cork and glass while pouring medicine.

Recork the bottle, read the label, wipe the rim of the bottle if necessary, and put the bottle away.

Pour some ice water into the medicine.

Fill a medicine glass with ice water and put it on the tray, carry the tray and its contents to the patient.

When the medicine is to be measured by drops, proceed as just described with the following exceptions: Leave the bottle on the table and, after removing the cork, fill the pipette,—to do this, put its point into the medicine, expel the air from its tube by pressing the bulb, and then release the pressure, whereupon the medicine will be forced into the tube (because the air having being removed, there will be no pressure within the tube to oppose the pressure of the liquid in the bottle).

Wash the glasses, etc., and put them away. If the glasses are dried, the drying should be done with either a special towel or a dish towel.

Local Applications

Local applications are made to wounds, the skin and cavities that communicate with the exterior; *e. g.*, nose, throat, eyes, ears.

Applications to the nose are usually made either by spraying, douching, painting, or inhalation.

The two methods of treatment first mentioned are attended with considerable danger and should only be given to patients by those who thoroughly understand the technic. There is somewhat less danger in their personal use but even thus they must be used with caution and under the direction of a doctor. The chief dangers attending the treatments are: (1) **If liquid is sprayed** from an atomizer into the nose with force, infective material in the nose may be forced through the minute canals that lead from the nose into cavities that exist in some of the bones of the face and thus cause a serious infection; (2) unless the solution used in the spray or douche is of the right concentration and alkalinity, it may irritate the lining of the nose injuriously; (3) **in the use of the nasal douche** infected matter may be driven into what are known as the *Eustachian tubes*, two small canals that lead, one on each side, from the throat to the middle cavity of the inner ear. The result of such infection may be very serious indeed.

Thus, to repeat, these treatments should not be used unless prescribed by the doctor and only the solution prescribed is to be used and the tempera-

ture of the solution is to be exactly as ordered. The spraying is done with a special atomizer simply by pressing the atomizer bulb, after the point of the atomizer has been inserted in a nostril. The pressure on the bulb is to be slow and without force. The safest form of appliance to use for **douching the nose** is a fountain syringe bag or irrigator can with tubing attached and a *nasal tip* inserted in the free end of the tubing. Also, there must be a clamp on the tubing to check the flow of liquid until it is required. **To use this appliance:** Put the solution prescribed by the doctor into the bag or can; hang this about twelve inches (not more) above the head, bend the latter over a basin, insert the point of the nasal tip in the nostril that the doctor has specified, open the mouth, let the solution run. It will run in one nostril and out through the other nostril and the mouth. The chief precautions to be observed are: (1) not to have the reservoir higher than stated above, not to cough, sneeze, swallow, or talk while the liquid is running through. If necessary to do any of these things, shut off the flow, for the three first mentioned may force fluid, etc., into the Eustachian tubes and the other two draw the tissue away from the openings of the tubes and thus facilitate the entrance of solution and infective matter into them.

Fig. 31.
Glass nasal tip.

Painting the membrane lining the nose is usually done by wrapping a small piece of absorbent cotton around a wooden toothpick, dipping this in the solution or ointment and rubbing it gently over the affected part.

Local applications are made to the throat in the same way as to the nose and, in addition, by gargling.

Less danger attends the use of sprays in the throat than in the nose, but too much force should not be used as it is possible to drive infective material into the Eustachian tubes.

The chief points to remember when painting the throat are: (1) that the back of the tongue must be held down so as to afford a good view of the tonsils and surrounding parts; (2) as a rule it is only the most inflamed parts that are to be painted and, as the drugs generally used for such purpose are very irritating, care should be taken not to include unnecessary parts in the application; be careful not to touch the back of the throat with the tongue depressor and only if necessary with the applicator, because this causes gagging and even vomiting; (3) never dip a used applicator into the solution; (4) do not touch the point of the applicator that has been in the mouth, roll the applicator in paper and have it burned as soon as possible for inflammatory conditions of the throat are often caused by germs that are very easily transmitted to others and cause very serious illnesses.

Inhalations intended to produce external local effects usually consist of steam either alone or with the vapor of certain volatile drugs that are added to the boiling water and vaporize with the steam. The purposes for which such inhalations are commonly used are: To relax spasmodic contractions of the muscles of the throat, such as occur in croup, and to soothe irritated membrane and congestion of the throat. The first mentioned result is effected chiefly by heat and the other two both by heat and the drugs used. Drugs are also given by inhalation to produce effects after absorption either upon distant or local parts. Examples of those affecting distant parts are the anæsthetics such as chloroform and ether.

Steam inhalations may be given either with the apparatus so arranged that the exit for the steam is in as close proximity to the patient's mouth as the heat of the steam will permit or a large kettle may be used and placed at a slight distance and a so-called *canopy* or *tent* so arranged that the steam is directed toward the patient in a manner that will allow of its being inspired.

There are a number of appliances sold for giving steam by close inhalations—most of them contain alcohol lamps for keeping the water boiling and are thus dangerous. What is known as the *Maw's inhaler* has no stove but is so made that it retains heat for a considerable length of time and is thus one of the best varieties to use. A pitcher is usually used in emergency but it does

Fig. 33. *A method of giving a steam inhalation.*

not retain the heat as long nor does the steam rise as well.

To get the best effects when a canopy is used it is well to have an *inhalation kettle* which has a long spout and a small opening in the cover through which air enters and forces the vapor through the spout. If an ordinary kettle is used, the cover must be raised at one corner for the same purpose as this opening. An electric stove is the safest variety to use and, next to this, a gas one. If obliged to use an alcohol stove —place it in a deep basin. When the canopy is arranged as in Fig. 33, only an electric stove should be used as the canopy comes in too close contact for any other variety to be safe.

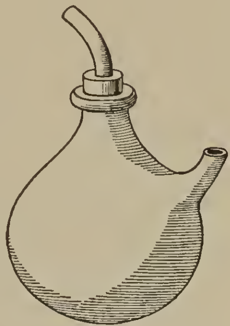


Fig. 32. Maw's inhaler.

The foundations of the canopies shown in Figs. 34 and 35 consist of frames that are attached to the bed, and that in Fig. 33 is an ordinary bed-cradle, but a screen can be used as a foundation for canopies arranged as Figs. 34 and 35, and a wooden box such as canned goods and other grocery supplies are bought in will answer as a substitute for the cradle. The canopy consists of a piece of old blanket pinned over the top of the frame (this is to absorb moisture which otherwise may condense and drop on the patient and bed-

clothes) and sheets. In Fig. 34 the sheets are pinned together in the center and then each sheet is folded back upon itself so that there is a seam in the center between which the spout of the kettle

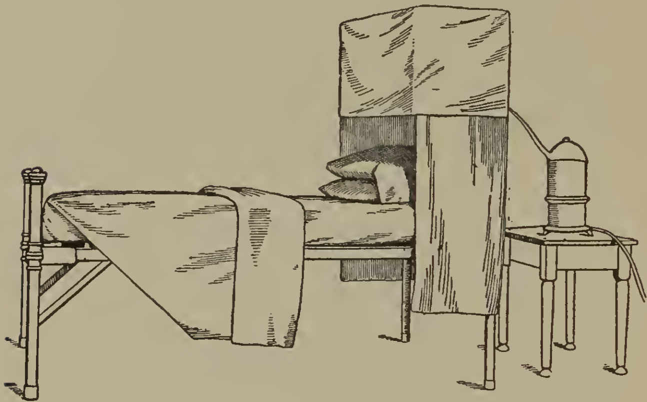


Fig. 34. A canopy arranged for steam inhalation.

is fitted and the steam thus enters at the back above the patient's head. In Fig. 35 one sheet is folded and pinned over the top of the frame and the other is pinned to this around the back and sides. The only essential difference in the two being that in the former, owing to the seam in the back, it is possible to let the steam enter from the back. When a cradle is used, as in Fig. 33, it is well to put a rubber between the blanket and sheet. otherwise, the kettle being so near the canopy, much of the steam escapes. The rubber and, perhaps, the blanket, will not be needed if the box

is used, but if the steam condenses and drops as it probably will be if the inhalation is continued for any length of time a folded piece of old blanket can be tacked inside the box. The box should have a

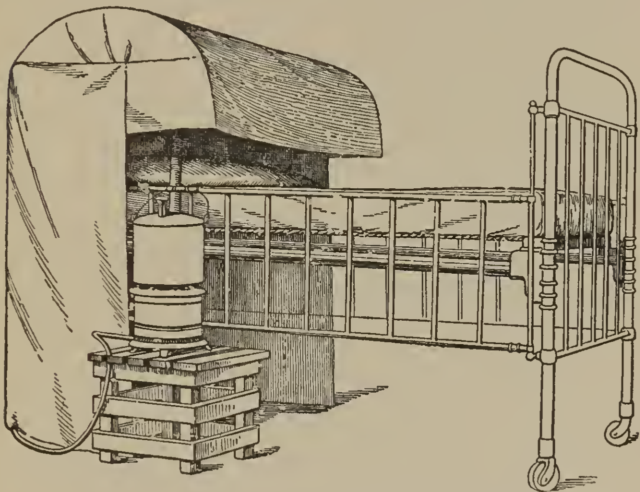


Fig. 35. A canopy arranged for steam inhalation.

depth of about twenty-four inches and one end has to be removed. In arranging the sheet, which should be doubled, leave a fold in front so that it can be drawn down over the patient's face from time to time, if desired, and thus the patient will get more vapor.

Some important points to remember when using steam inhalations are: 1. They will probably do more harm than good unless the patient remains in bed, or at least in one room, during the entire time that the treatment is used.

2. The volatile drugs used for such purpose are, almost without exception, inflammable, and thus the bottle containing the drug used should not be brought near the flame.

3. The stove is to be placed where there is no danger of the bedcovers coming in contact with it or else a guard must be placed around it, *e. g.*, it can be placed in foot-tub or deep granite basin.

4. The spout of the kettle must not project far enough under the canopy for it to come in contact with the patient.

5. A small child should not be left alone while receiving such treatment, for it may easily upset the kettle or otherwise burn itself.

Demonstration 15

Application of Medication to the Throat

Requisites for painting or swabbing the throat: 1. Tongue depressors. Small strips of wood, made for the purpose, can be bought at any drug store and are the best things to use for this purpose. In emergency, however, the handle of a spoon can be used.[1]

2. Applicators, the best kind, consist of a slender strip of wood with a piece of absorbent cotton, about one inch wide and two to two and a half inches long wound around one end. The

[1] If a spoon is used it must be boiled after use. The wooden strips are burned.

cotton should be left loose at the point and wound very tightly at its upper end so that it will not fall off. Strips of wood intended for this purpose can be bought at most drug stores, but, in emergency, the cotton can be wound around a pencil or penholder.[1]

3. A paper bag or folded paper into which the depressor and applicators can be put after use.

4. The drug, a small bottle with water can be used for class.

5. A small glass.

Requisites for spraying the throat: 1. An atomizer.

2. A handkerchief.

Requisites for giving inhalations: 1. A Maw's inhaler and a piece of flannel or old blanket or a bath towel.

2. A foundation for a canopy, see page 152.

3. Two sheets and a piece of old blanket.

4. A paper of pins.

5. A kettle.

6. A stove.

7. A stand for the stove and, if necessary, something to protect this from the heat.

[1] After an applicator has been used it must not be dipped into the solution. If more solution is needed, take a fresh applicator or, if a pencil or penholder has been used, wind fresh cotton around it. When removing the cotton, do not touch it with your fingers, to avoid doing so you can cover it with paper.

Procedure when painting or swabbing the throat[1]**:** Wash your hands. Arrange the applicators as directed on page 154. See that the subject is where the light will fall into her throat. Pour a small amount of the liquid to be used into the glass.

Place this where you can reach it easily.

Depress the tongue by placing the point of the depressor upon the highest part of the curve of the tongue (which hides the part of the throat that is usually most affected) and press it downward. Do not let the depressor touch the back of the throat.

Dip the cotton of the applicator into the solution.

Swab the affected parts of the throat with this.

Procedure when spraying the throat: Place the subject[2] where the light will shine into her throat.

Place the handkerchief where she can reach it.

Depress her tongue as described in the preceding section, but it can be done with the stem of the atomizer, press the bulb and be sure that the solution reaches all congested parts.

Procedure when arranging steam inhalations with a Maw's inhaler: Heat the utensil by pouring water into and over it.

[1] The procedure for nasal treatments will not be described. They were mentioned merely to tell the pupils of the dangers attending their use. This seemed advisable, because they are so commonly used unnecessarily and with harmful results. As previously stated, they should only be used when prescribed by a physician and his instructions should be accurately followed.

[2] The students may act as subjects for each other or they may stand in front of mirrors and carry out these treatments on themselves.

Pour out this water and then pour in enough **boiling** water to reach the level of the opening of the air channel (see Fig. 33) and add the drug, if one has been prescribed.

Insert the cork with the mouthpiece attached and wrap the inhaler, except the tip of the mouthpiece, in flannel or a bath towel.

If the water is boiling when it is used and the inhaler is properly heated before the water is put into it, vapor will continue to arise for at least twenty minutes.

Procedure when arranging for steam inhalations with a canopy: Secure the foundation in place and cover the top of this with a piece of old blanket.

Drape the sheets around the foundation and pin them in place. The manner of doing this will depend upon the foundation. The way in which it has been done in the accompanying illustration has been already described. If screens are used the sheet around the back and sides should be pinned on the inside so as to protect the screen.

Put the stove in place. If necessary protect the stand.

Fill the kettle to about three fourths its capacity with **boiling water,** add the drug, if one has been prescribed, and put this on the stove.

Irrigation of the Ear

Earache is a trouble for which home remedies are often used and, if they are successful, no medi-

cal advice is sought. To show the error of this and of the danger of ill-advised treatment a few words will be said here regarding the anatomy of the ear and the physiology of hearing.

The ear consists of three distinct parts termed the *outer ear*, *middle ear*, and *inner ear*.

The outer ear consists of the auricle (the part outside the head) and the auditory canal. The latter in the adult is about 1¼ inches long and is curved so that its central portion is higher than the opening or terminal. The outer portion of the canal is of cartilage, the remainder is hollowed out of the temporal bone. In small children the bone is less formed and the canal is straight. This difference in the shape of the canal must be remembered when irrigating the ear. The canal is lined with a membrane in which there are cells that secrete a sticky substance, known as *cerumen* or *wax*, which is intended to keep foreign substances from enter-

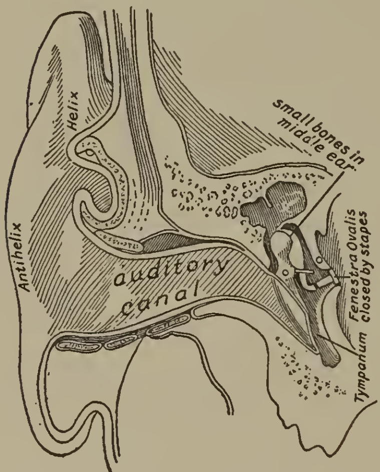


Fig. 36. Vertical section through the external auditory meatus and tympanum, passing in front of the fenestra ovalis. Note shape of auditory canal.

ing the ear. Normally, only a small amount of cerumen is secreted, but, if the canal is irritated, the cells may become overactive and secrete so abundantly that hard masses of wax are deposited.

The middle ear is a cavity hollowed out of the temporal bone. It is divided from the canal of the outer ear by a very thin membrane, known as the *tympanum* or *drum*. Three small bones called because of their shapes, the *hammer*, *anvil*, and *stirrup* stretch across the cavity. One end of the hammer is attached to the drum and the other to the anvil. The free end of the anvil is attached to the stirrup and the free end of the latter to a membrane that is stretched across one of the two openings that lead into the inner ear. In the back part of the middle ear there is a minute passage into the part of the temporal bone known as the *mastoid*, and there is also a canal leading into the throat. This is known as the *Eustachian tube* and its purpose is to equalize the air pressure on both sides of the drum.

The inner ear consists of three cavities, known as the *vestibule*, the *cochlea* or *snail shell*, and the *semi-circular canals*. In each of these cavities there is a membranous bag, and the spaces between the bone and bags and within the bags contain fluid. That surrounding the bags is known as *perilymph*, and that within the bags as *endolymph*. The fibers constituting a portion of the membrane within the cochlea are connected with processes of the auditory nerve, this is also the case with the

membrane in the semicircular canal, but the nerve fibers extending from this portion of the ear only go for a short distance into the brain with the fibers from the cochlea and then they branch off and connect with portions of the brain that help to control the coördination of certain muscles. Thus the semicircular canals are not concerned with hearing, but with maintaining balance.

Sound consists of wave-like vibrations in matter (usually the air)[1] that affect the auditory nerve. When the waves enter the ear they make the drum membrane vibrate in like manner, this induces similar vibrations in the small bones of the middle ear and, in turn, the lymph and membrane of the inner ear. It is thought that the fibers of the membrane in the cochlea that are connected with the auditory nerve are held at different tensions and are thus affected by waves with different rhythms (just as, if the cover of a piano is left open and a note struck on another musical instrument in the room the same string in the piano will vibrate), and that the interpretation in the brain depends at least partly upon the nerve fibers over which the impulses come.[2]

[1] Sound is transmitted through liquid and solid matter even more readily than through air, for example, the vibrations produced in water by the paddle wheel of a steamer can be heard a mile away if the ear is held near the water.

[2] It is to be realized that we do not actually hear with our ears or see with our eyes or feel at the exterior of the body. These parts being merely the portion of the various mechanisms that receive and transmit the external stimulus to the brain.

The most common abnormal conditions of the ear and their causes are:

1. The collection of wax in the auditory canal.
2. The formation of pimples or boils in the canal.

The most common cause of both of these conditions is irritation of the canal in the endeavor to clean it with pins and the like and by putting irritating liquids into it in the treatment of earache. It is usually unnecessary to clean the ear further than the tip of the small finger can reach and, if so much wax is being secreted that further means are necessary, a doctor should be consulted. The tip of the finger should be covered with a clean, soft cloth before being put into the canal.

3. Blocking of the Eustachian tubes. This is usually the result of inflammation in the throat, or enlarged tonsils, or the presence of adenoids. It interferes with the passage of air into and out of the tubes and, therefore, the air pressure on the two sides of the drum becomes unequal and the normal vibration of the latter is interfered with. This interferes with hearing and it is likely to cause ringing and buzzing sensations, because the auditory nerve endings are stimulated.

4. Inflammation of the middle ear. This is usually due either to the extension of inflammation from the throat (*e.g.*, tonsillitis) or to forcing virus from an inflamed throat or nose into a tube by improper irrigation or spraying of the nose or throat.

Thus it can be appreciated that earache is not a condition to be left to home treatment. If it occurs when it is not convenient to consult a doctor, as at night, heat can be sometimes applied in the form of a hot-water bag or an irrigation, as described later, but, even if the pain ceases, the doctor should be consulted as soon as possible so that the cause of the earache can be found and removed.

If, however, the pain is behind the ear, heat should not be used without first consulting a doctor, even if it is at night, especially if the sufferer is a child, because pain behind the ear is often due to a dangerous condition known as *mastoiditis*.

Demonstration 16

Irrigation of the Ear

Equipment: 1. A fountain syringe bag or other type of irrigator with a clamp on its tubing and, if possible, a return flow aural nozzle[1] in its free end; a piece of rubber tubing between twelve and fourteen inches long on the side projection of the

[1] Fig. 37 shows a return flow aural nozzle. The dotted line indicates a small tube inside the nozzle through which the water flows from the reservoir into the ear. As can be seen in the illustration, there is room for the water flowing from the ear to re-enter the nozzle around this tube and it flows from the nozzle through the side projection. This is about the best appliance to use for irrigation of the ear because, if the reservoir is not raised more than about twelve inches the water will flow in and out of the ear without making any pressure on the drum.

nozzle. About one quart of water with a temperature between 106° and 110° F. in the reservoir.

2. A rubber ear bulb[1] and a basin containing water with the temperature mentioned above.

3. A thermometer to take the temperature of the water.

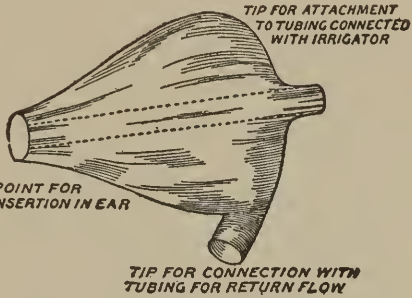


Fig. 37. Glass return-flow ear nozzle.

4. A basin with a capacity of about one quart.

5. A bath towel and pin.

6. Pledgets of absorbent cotton made by taking pieces of cotton about 1½ inches square and twisting one end of each piece into a point that will allow of its ready insertion in the ear; the twist must not be very tight or the power of the cotton to absorb the moisture from the ear will be lessened. If cotton cannot be obtained pieces of soft, clean muslin can be used but, as they will not remain

[1] Rubber bulb ear syringes are cheaper than the above apparatus and are therefore more commonly used, but they do not allow of the steady, constant flow of water provided by the other appliance and, unless care is taken not to squeeze a bulb quickly or forcibly, enough pressure will be made on the drum to cause pain.

twisted, they are only prepared when needed. On no account should any hard pointed implement be put into the ear by anyone but a doctor.

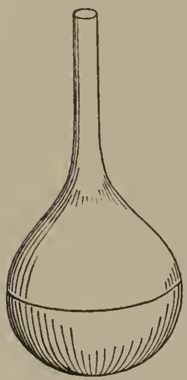


Fig. 38. Rubber ear syringe.

7. A receptacle for used pledgets.

Procedure when a return flow nozzle is used: Hang the reservoir about twelve inches above the patient's ear.

Have her lie or sit with the affected ear uppermost.

Put the towel around her neck and, unless she is lying down, pin it.

Hold the nozzle over the basin, open the clamp on the tubing and let enough water run through the tubing to heat it and expel the air. Check the flow and place the basin the same distance below the ear that the reservoir is above it. Put the free end of the tubing for the return flow into the basin. Insert the tip of the nozzle in the auditory canal and let the water flow. While it is doing so pull the auricle of the ear backward and, if the patient is an adult, upward (the reason for this was mentioned on page 158).

If pain or dizziness are occasioned, lower the reservoir as these sensations are usually occasioned by too much pressure on the drum.

Shut off the current before the solution reaches the lower exit of the irrigator.

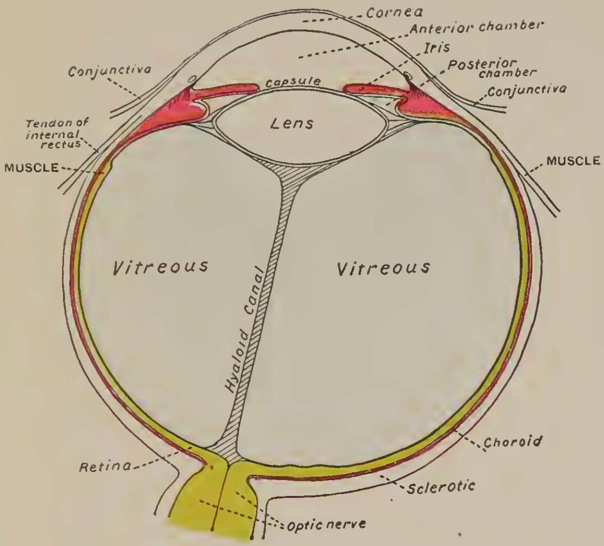


Fig. 39. Diagram of the right eye in horizontal section, showing the upper surface of the lower segment.

Remove the basin, etc., and, if necessary, dry the neck and around the ear.

Insert the pointed edge of a pledget in the ear, while doing this hold the auricle in the manner just described so as to straighten the canal.

Change the pledget after a few minutes and continue doing this until the pledget removed is dry. Do not rub the walls of the canal.

If the irrigator is used without a nozzle make the following differences in the procedure: Hold the basin for the return flow pressed tightly against the neck under the ear being treated. Put the free end of the tubing at, but not actually in, the orifice of the canal; that is, space enough must be left for the exit of the water.

When a bulb syringe is substituted for the irrigator, fill it by holding its tip in the water and pressing the bulb. To use it hold the point at, but not in, the opening of the auditory canal and press the bulb gently and slowly. Otherwise, the procedure is the same as when an irrigator is used.

Application of Medicine to the Eyes

There is, probably, no part of the body more easily injured than the eyes and no attempt should be made to treat abnormal conditions of these organs without first consulting an oculist.[1]

Two particularly important reasons for this are:

[1] A physician who specializes in the treatment of diseases of the eyes.

(1) Redness of the lids, styes and the like, which people are so prone to treat according to the advice of their friends, are very often the result of eye-strain, *i.e.*, of forcing certain small, and exceedingly delicate, muscles within the eyeballs to do more work than they are fitted to perform. Their work is to so adjust a part of the eyeball, known as the *lens*, that the light rays entering the pupil[1] from different angles are brought to a focus on a certain part of the inner wall or *retina*[2] of the eyeball. When we are looking at things in the distance these muscles are at rest, but, when we look at anything near at hand, the muscles contract and this makes the lens[3] become more convex and the rays of light are then brought to a focus sooner than they otherwise would be. Quite a number of abnormal conditions may exist in the eyeball that

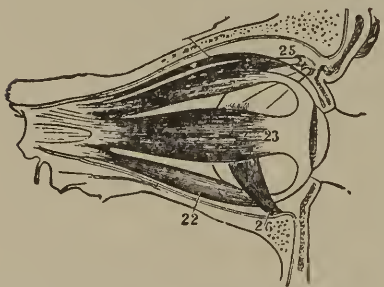


Fig. 40. Muscles that move the eyeball. (Gerrish.)

[1] The hole in the iris, which is the colored portion in the front wall of the eyeball.

[2] The retina consists chiefly of a portion of the optic (sight) nerve.

[3] The lens is a transparent jelly-like body that is surrounded by a thin transparent membrane. The latter is attached at either side of the eyeball to the ciliary muscles and is held suspended behind the iris and pupil and in front of the retina.

will make it harder for these muscles to do their work effectually or the defect may be in the muscles themselves. In either case, the muscles are likely to be injured if they are not helped by the use of glasses that will give the required aid in refracting (bending) the rays of light entering the pupil. The local irritation arising when these muscles are undergoing strain, for reasons given on page 80, may induce congestion and consequent abnormal conditions of the eyes and lids. It can be appreciated from what has been said, that treatment which temporarily relieves congestion and its external results, but not the conditions promoting the strain, are not to be relied upon.

2. The other particularly important reason for consulting an oculist if the eyes become at all inflamed is that they are subject to infection by a number of organisms that may speedily cause severe inflammations and even blindness.

The treatment of the more serious inflammations requires an expert and those described here are only such as are frequently prescribed for simple congestions and the like, such as are promoted by eyestrain; they should, however, only be carried out upon the advice of a doctor.

Demonstration 17

Irrigating and Putting Medicine in the Eyes

Articles required for an irrigation: 1. A small clean basin containing about one half to one pint of

whatever solution is ordered (warm water—about 100 F.—will answer for class) and some pledgets[1] of absorbent cotton.

2. Dry absorbent cotton pledgets.[1]

3. A towel and safety pin.

4. An empty basin.

5. A receptacle for used pledgets.

Articles required when an eye-bath is used for cleansing or the application of medication: (1) an eye-bath, about three quarters full of the solution prescribed (the eye-bath is a small oval cup that fits around the eye).

(2) A towel and pin.

Articles required for putting drops of medicine in the eyes: 1. The drug that is to be used (for class clean warm water in a small bottle).

2. A medicine dropper.

Important precautions to be taken when giving these treatments are: (1) Do not let the tip of the medicine dropper come in contact with the eye; (2) avoid making pressure upon the eyeball when separating the eyelids; (3) when irrigating the eye, direct the current toward the outer angle of the eye and away from the nose, because there is a small duct leading from the eye into the nose[2] and

[1] Pieces of cotton about an inch or an inch and a half square.

[2] This duct is intended as a passageway for the tears which are being constantly secreted by glands at the upper and outer angles of each eye. These tears are intended to keep the surface of the eye moist. Unless they are secreted in unusual amount (as when the person is crying) their presence is not marked, for their evapo-

if any foreign substance is washed into it serious trouble may result; (4) do not use anything rough, as gauze, for wiping the eye—absorbent cotton is particularly good for the purpose; (5) be careful to have the solution the strength and temperature prescribed by the physician.

Procedure when irrigating an eye: Pin the towel around the patient's neck.

Scrub your hands.

Have the patient sit or lie with the head thrown back and so tilted that the eye to be treated is slightly lower than the other (in order to avoid washing discharge into the well eye) and place or have patient hold the empty basin where the solution will flow into it.

Wash any adherent discharge from the lids with pledgets moistened with solution. Do not put a used pledget back into the solution.

Separate the lids by making traction upon the flesh above and below the lids with the thumb and first finger of your left hand,[1] making all necessary pressure upon the lower ridge of the forehead and upper part of the cheek bone, *never on the eyeball.*

Squeeze the solution over the eye from the pledgets in such a manner that it will be directed away from the inner angle of the eye. During the treatment have the patient look upward and downward, making the change by moving the eyeball,

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ration or passage into the ducts leading into the nose keeps pace with the rate of secretion.

[1] Each pupil should practice doing this on herself.

not the head, so that as much of the eyeball at possible will be subjected to the irrigation.

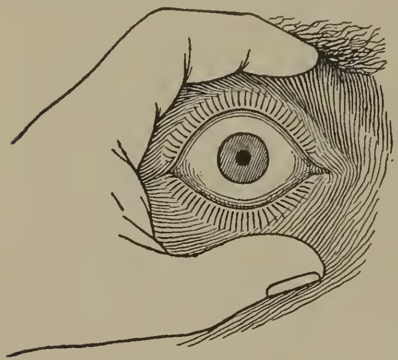

Fig. 41. Drawing the eyelids apart by making traction on the flesh above and below the eye, exerting necessary pressure on the bones of the forehead and cheek.

At the conclusion of the treatment dry the eye by gently patting around it with a pledget and dry the face with the towel.

Procedure when using an eye-bath: Pin the towel around the patient's neck, give her the cup and instruct her to (1) bend her head forward and press the cup firmly around the eye, keeping the eye closed while doing so, and (2) (pressing the cup in place) to throw her head backward and, for the length of time prescribed, which is usually two to five minutes, to keep alternately opening and closing her eye and moving the eyeball; (3) to bend her head forward and remove the glass.

Procedure in dropping medicine in the eye: Place the patient with her head tilted slightly backward; take up as much of the drug in the dropper as required, but leave the latter in the bottle. Draw down the lower eyelid with the first finger of your left hand and tell the patient to look upward.

Take the dropper in your right hand and, holding it slightly above, but not touching the eye, make very slight pressure on the rubber nipple of the dropper so that the number of drops prescribed will fall on the inner surface of the lid. Release the lid slowly and tell the patient to close her eye. When the medicine is applied in this way it enters the eye quite as well as when it is dropped directly on the eyeball and it causes less irritation.

Applications to the Skin

The purposes for which applications are most frequently made to the skin are: (1) To overcome abnormal conditions of the skin itself or of the tissues situated directly beneath it; (2) to lessen congestion and pain in the internal organs and (3) to cause the expulsion of gas from the stomach and intestines. Also, there are a few drugs that can be absorbed through the skin and these are sometimes administered by a process known as *inunction*.

Examples of the uses of applications to cure external abnormal conditions are: (1) To lubricate or soften roughened skin or mucous membranes; (2) to dry moist surfaces, especially those denuded of skin; (3) to act as astringents, that is, to cause contraction of tissue and thus lessen the amount of blood in the part and check secretion; (4) to depress sensory nerve endings in the part and thus alleviate local pain; (5) to kill or render inert

organisms causing skin lesions; (6) to soften tissue and increase the amount of blood in an infected part and thus get a local increase in the amount of white corpuscles and other substances that the blood contains for fighting bacteria—heat[1] is the agent most commonly employed for this purpose; (7) to lessen the amount of blood in an area and thus relieve pain due to congestion;[2] cold[2] and drugs, which act as astringents described above, are generally used for this purpose and, when they are employed, the inflamed part is usually raised for this favors the flow of blood away from it and slightly impedes the flow toward it.

The external applications used to affect the internal organs are: Irritant substances such as mustard, turpentine, and iodine; heat; cold. Irritant substances used to relieve pain are known as *counterirritants* because they counter or relieve pain already existing. Heat also induces irritation and thus acts as a counterirritant and, as it induces a particularly marked dilation of blood-vessels and softens and expands tissue, it is often a particularly valuable one. The relief of pain and

[1] As previously stated, when a part is congested the local blood-vessels are dilated and distended with blood, this results in an increased exudation of lymph into the tissues of the part and this sometimes induces pressure on nerve endings thereby causing pain.

[2] Heat or cold should not be used without a doctor's order for these purposes, because heat tends to promote suppuration (the formation of pus) which under some conditions may be harmful, and cold, by forcing the blood away from a part reduces the amount of protective substances to fight the bacteria.

congestion in the internal organs by counterirritants and cold depends upon the fact that nerve fibers extending from the skin connect in the spinal cord with fibers that transmit impulses to the viscera (internal organs). Neither heat nor cold, in degrees that can be used on the skin, penetrate the tissues, but irritation on an area of skin will give rise to nerve impulses that pass to the cord and are discharged over the connecting fibers to the muscle tissue in the organs and blood-vessels situated below that area of skin. The impulses contract the blood-vessels and, thereby, force blood from the area so that congestion and pain due to it are lessened and when, for example, hot fomentations are applied to the abdomen the muscle tissue in the walls of the stomach and intestines contracts and forces gas from the organs.

If too severe irritation is produced by any means blisters are likely to form because extreme irritation increases the amount of blood in the irritated part to such a degree that there is excessive transudation of fluid from the vessels and this separates the outer from the under layers of skin, which constitutes a blister. Certain irritants, especially cantharides, are used purposely to produce blisters, and, if properly applied, they will do so without injuring the underlying tissues but, when irritation severe enough to cause blistering is produced by the majority of irritants, lesions that are very hard to cure may be caused.

The medicated preparations most commonly

used for external applications are: Solutions, liniments, ointments, plasters, pastes, poultices. **Articles commonly used for hot applications are:** Hot-water bags, electric pads, the flatiron, salt, fomentations or compresses, poultices; also, there are electric baths and ovens but these are seldom available for home use. **Articles commonly used for cold applications are:** Ice-caps and compresses.

Solutions are liquids containing dissolved matter. Most of those used for external applications are disinfectants[1] and some of them are also astringent,[2] and the so-called tincture of iodine is both a disinfectant and a counterirritant.

Liniments are liquid or semi-liquid preparations the majority of which contain irritant substances in an oily or alcoholic medium. They are used chiefly to, by counterirritation, relieve pain in superficial tissues.

Ointments are soft preparations of fatty substances in which, as a rule, a drug is incorporated. Drugs with various actions are used in this way and therefore ointments are employed for a number of different purposes.

Plasters are preparations of drugs combined with a resinous substance that is spread upon and adheres to a foundation of muslin or similar material.

[1] Substances that kill bacteria.

[2] Substances that cause the contraction of tissue. Many astringents also lessen the sensitiveness of nerve endings and these lessen pain.

Pastes are soft viscid substances. Mustard paste and mustard plaster are known as *sinapisms* from the Latin name for mustard, *sinapis.*

Poultices are soft, hot, moist pastes. Anything that can be made into such a paste and that retains heat well can be used for the purpose, but flaxseed or, as it is generally called, linseed, is usually preferred as it is inexpensive and answers these requirements particularly well. Antiphlogistin or clay poultice, which consists of kaoline (a form of clay), glycerine, and several drugs with mild counterirritant properties, is also considerably used and, for small poultices, bread.

Stupes or fomentations consist of flannel or compresses of gauze or other soft material wrung out of very hot water.

Demonstration 18

Methods of Using: Iodine, Liniments, Ointments, Plasters and Articles Employed for Hot and Cold Applications[1]

Equipment for demonstration:

A bottle of tincture of iodine and some applicators (matches with small pieces of absorbent cotton twisted around one end can be used), a receptacle for used applicators (a paper bag will answer the purpose).

[1] Most of these procedures are so simple that, if time is limited, a few questions regarding necessary precautions and methods will be as valuable as a demonstration.

A jar of ointment, a spatula (a knife can be substituted), compresses of gauze or soft muslin, a bandage.

A piece of a plaster such as cantharides or belladonna, if it can be obtained, but this is not important.

A hot-water bag and cover.

An electric pad, if one can be obtained easily.

A bag of salt, a pan, spoon, and stove.

A flatiron and a piece of flannel or flannelet about half a yard.

An ice-cap and cover (a piece of thin soft muslin will answer the purpose), ice and appliances for cracking it.

Arrange the articles required for cold compresses on a small tray, such compresses are most commonly used for the eyes and on the forehead to relieve headache. The articles required are: Two small bowls, one enough smaller than the other to be inverted in it. A lump of ice placed on top of the inverted bowl, a little water in the other bowl, compresses for the eyes which should consist of small squares, about an inch, of absorbent cotton or folded pieces of soft muslin. Compresses for the forehead, viz., pieces of gauze or muslin or a handkerchief folded to fit the forehead. A receptacle for used compresses, a towel.

Procedure: The demonstration doll for the patient.

To apply iodine: Dip the covered end of the applicator in the iodine and then rub this on the

skin, let the application dry, if the skin does not become a deep brown color, repeat the procedure. When it is employed to produce counterirritation, enough iodine must be used to produce a fairly deep brown color and induce a slight stinging sensation that will be felt for a few minutes, but too much must not be used or blisters will result. Other precautions necessary are: The skin must not be moist and thus iodine should not be applied soon after the part has been washed, for moisture increases the irritant action of the iodine; the part should be left exposed for a time. If too much irritation is induced the iodine can be easily removed by washing the part with ammonia water or strong soapsuds or alcohol.

To apply a liniment: Place the patient in a comfortable position; pour a little liniment on the part (do not let the rim of the bottle touch the patient's skin) and rub the liniment into the skin, exerting as much pressure as the patient can tolerate. Continue to do this for from ten to twenty minutes; use more liniment if necessary to maintain a slight stinging sensation.

Ointments are applied in two different ways: (1) They are rubbed into the skin; (2) they are spread on some soft material as muslin or a gauze compress and bandaged over the part. Ointments are applied in the manner first mentioned both for local effects and in order that the drug contained in the preparation may be absorbed. Especially when the ointment is used for the latter purpose

it is important that the skin be first washed with soap and hot water and, if possible, alcohol so as (1) to remove the sebaceous matter, which is always present on the skin and interferes with absorption, and (2) to make the skin soft and red, the redness is due to an increased supply of blood in the part and this favors absorption. When ointment is rubbed into the skin to promote the absorption of a drug the process is known as *inunction*.

When ointments are used on sores or wounds the second method of application is generally employed and the following precautions must be observed: (1) The gauze or muslin must be sterile, if there are no sterile supplies at hand a piece of clean muslin can be sterilized by passing a hot iron over it several times. (2) The ointment must be taken from the jar and spread with a spatula or a suitable substitute as a knife and this should be boiled before use. (3) Enough ointment must be used to prevent the dressing sticking to the sore or wound.

Plasters, with the exception of sinapisms, are usually prepared for use by warming them, which softens the resinous substance; this can be done by putting it in a warm oven for a few minutes or under the lighted jets of a gas stove; the skin should be prepared in the same manner as for an inunction and it should be warm when the plaster is applied. The latter is laid on the skin and pressed slightly with the hand which makes it adhere to the skin.

If necessary it is covered with a bandage. The method of using sinapisms will be described in Demonstration 19.

Methods of Using Articles Employed for Applying Dry Heat to the Body

To fill a hot-water bag, remove the stopper and roll the bag from the bottom upward so as to expel the air, otherwise, the hot water is likely to spurt out over your hands, being forced out by the expanding air.[1] Let the water flow in, this should not be hotter than about 180° F. If the bag is to be put on the body do not fill it to more than about one quarter to half its capacity, or it will be too heavy; if it is to lie on the bed, you can put more water in, but do not fill it to its full capacity. Insert the stopper and, after doing so, hold the bag upside down to ascertain if there is leaking, this most frequently occurs around the stopper as the result of an absent or defective washer. Put the bag in a flannel or flannelet cover, stopper first, so that if the cover becomes loosened the metal stopper will not come near the patient, for, as metal absorbs and parts with heat more readily than rubber, it is much more likely to cause a burn.

It is to be remembered (1) that a patient's word is never to be relied upon as to the suitability of the temperature of a hot application, because if a person is in pain a burning sensation may not be

[1] It will be remembered that air is expanded by heat.

perceived or it may be a relief. (2) The hand is not as sensitive to heat as other parts of the body and therefore when testing a hot application hold it against your arm or cheek. (3) Some people are more easily burnt than others and therefore when a hot-water bag or other hot application is placed directly on the skin look at the latter after a few minutes and see if it is a deep red, if so, the application is probably too hot; this care is especially necessary with small children and the aged.

Warm salt is sometimes used as a hot application when a hot-water bottle cannot be obtained. To heat the salt, empty it into a pan and place it, preferably, in a hot oven, though it can be heated on top of the stove. Stir it occasionally, and when hot enough pour it into a muslin bag.

Two important things to remember about electric pads are: (1) The insulating material wears off in the course of time and thus old pads should be inspected before use; bedclothes have caught fire from defective insulating material. (2) Pads may become dangerously hot after they have been in use for some time.

Ironing the affected part with a flatiron will often afford great relief in conditions such as stiff neck and lumbago. To do this, dry the skin thoroughly, cover it with a piece of flannel, and pass a heated iron back and forth over the latter for about twenty minutes. Have the iron as hot and make as much pressure as the patient can endure. It may be necessary to press lightly at first and increase the

degree gradually. Raise the flannel from time to time to see that the skin is not too deep a red.

Methods of Using Articles Employed for Cold Applications

The special points to remember in connection with the use of ice-caps are: 1. To break the ice into pieces about the size of a walnut; if the pieces are larger than this the cap is not likely to fit over the part well, if smaller they will melt too quickly.

2. Let some hot water run over the ice to blunt the sharp edges which might pierce the rubber.

3. Roll up the sides of the cap before putting in the ice, and, after doing so, squeeze it above the ice, to expel the air.

4. Do not fill a cap more than three quarters its capacity and not even this much when its weight will cause discomfort. Cover it with a piece of thin muslin.

5. If the weight of a cap annoys the patient tie the cap to some support such as a bed-cradle or the substitute mentioned on page 78, and place this so that the cap will barely rest upon the part.

The care of ice-caps after use was described in Chapter I.

Cold compresses are sometimes used as substitutes for ice-caps as a means of **applying cold to the forehead.** To use them, arrange the tray as described on page 176 (the ice is raised above the water because this retards the melting). Saturate

the compresses in the water and then place them on the ice. When one is thoroughly chilled squeeze the water from it and place it on the forehead. When it becomes warm replace it on the ice and put the cool one on the forehead.

Cold compresses for the eyes are used in the same manner except that, as a rule, a number of them are provided for they need to be changed more frequently and, if there is any discharge from the eyes, the same one should not be used twice. Separate compresses should be used for each eye if both eyes are being treated.

A very important thing to remember about the use of cold is that as long as the treatment is continued the use of the cold must be constant for, otherwise, the reaction effects described in Chapter VI will occur during the intervals that the cold is reduced and this is likely to be harmful in some conditions for which local cold applications are prescribed.

Demonstration 19

Preparing, Applying, and Removing Sinapisms

Equipment: 1. Mustard plaster.[1]
2. Mustard.
3. Flour.
4. Tepid water.
5. Oil.

[1] Mustard plasters are commonly called *mustard leaves.*

6. Bowl.
7. Spatula.
8. Tablespoon.
9. Plate.
10. Gauze.
11. Two towels.
12. Basin of warm water.
13. Washcloth.

These will not be needed until the paste is to be removed.

Some important facts to remember regarding the use of mustard are: The counterirritant action and flavor of mustard are due to a volatile oil which is developed by the action of a ferment that is contained in the mustard and becomes active when the mustard is wet. This ferment is destroyed by a temperature exceeding 140° F. (60° C.) and its action is inhibited at considerably lower temperatures so that, if the liquid with which the mustard is mixed is hotter than about 106° F. the amount of oil developed (and hence the counterirritant action of the mustard) will be limited. Nevertheless, mustard is considerably used in hot poultices and baths because, if it is only added to the heated substance just before the latter is used it will have a slight counterirritant effect for a short time and thus increase the effects of the heat, but when the counterirritant effect is to depend solely upon the mustard the water used must not be hotter than 106° F. The ferment becomes less

active when mustard is kept for any length of time, especially in hot weather, and thus in summer time and in hot countries it is usually necessary to use relatively more mustard. When preparing a mustard paste for a child or an aged person it is well to add a little oil, because this softens the skin and thus lessens the tendency of the outer layer to separate from the derma as described on page 173. The skin should be washed when a sinapism is removed because particles of mustard are likely to adhere to it and cause blistering.

Procedure in the use of mustard plasters:

To prepare a leaf for use, dip it in tepid water, fold it in a gauze compress, arranging the latter with only one thickness over the mustard surface. Lay the leaf, mustard surface uppermost, on a folded towel. Leave this towel in place when you apply the leaf as it will protect the patient's nightgown and the bedcovers from the moisture. It is rarely necessary to secure a sinapism in place and, usually, it is better not to do so as, if it is loose, the color of the skin can be more easily watched, which is imperative, for mustard blisters some skins very readily.

Remove the leaf when the skin is well reddened. This is usually in about twenty minutes, but, sometimes, in ten or even less. Wash the skin with warm water and dry it. Make sure that no particles of mustard adhere to the skin. If the skin is very red, apply some oil or other lubricant.

Mustard pastes are made of mustard, flour, and

tepid water and, for the reason given on page 184, oil is sometimes added. **The relative proportion of mustard to flour required** varies for the reasons given on page 184. Ordinarily, in a temperate climate, about one part of mustard to three or four of flour is necessary for an adult and one to six or eight for a child. About five tablespoons of material are needed to make a paste six inches square.

Procedure: Put the mustard in a bowl; crush all lumps.

Add the flour and mix the two ingredients thoroughly.

If oil is to be used, add about two teaspoonfuls.

Add enough tepid water to make a paste that can be spread easily, but that will not run.

Lay a gauze compress on a plate and spread the paste in the center of the former, about one eighth inch thick. Fold the edges of the gauze over the back of the paste.

Place the paste, the side with single layer of gauze uppermost (this is the side that goes next the skin), on a folded towel. Put it on the patient. Take the same precautions while it is on and when removing it as for a mustard leaf.

Demonstration 20

Making and Applying Poultices

Requisites for demonstration: 1. Flaxseed. 2. Baking powder or sodium bicarbonate.

3. Mustard.
4. Boiling water.
5. Cup measure.
6. Utensils provided for cooking poultices in.
7. Stove.
8. Spatula or knife.
9. Tablespoon.
10. Towel.
11. A piece of board or large platter.
12. Flannel cut the size and shape required for the poultice.
13. Binder and pins.
14. Gauze or thin muslin on which to spread the poultices. For a square or oblong poultice this can be cut twice the size that the poultice is to be,

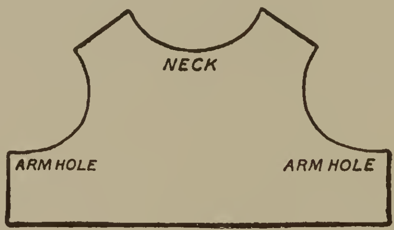

Fig. 42. Shape of poultice to cover chest.

plus about three inches to allow for turning over the edges of the paste, which is spread on one half of the material and covered with the other half, but when any complex shape is needed (*e. g.*, for the chest) it is well to have fairly firm muslin for the foundation and gauze or thin muslin for the cover, and to cut these the required shape. See Fig. 42.

Cut the foundation two and the cover three inches larger on all sides than the finished poultice needs to be.

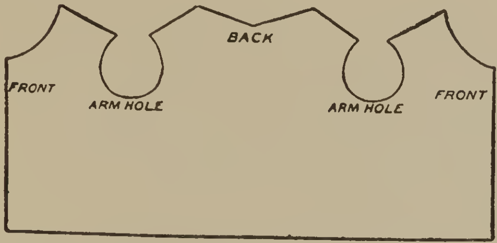

Fig. 43. Shape of binder to retain poultice in place.

15. A doubled piece of flannelet the shape of the poultice with which to cover the part after the removal of the poultice.

16. Oil or vaseline, a gauze or cotton sponge with which to apply it, and a dish to put the latter in after use.

17. Antiphlogistin and a small empty bowl or jar. A saucepan containing water.[1]

18. Some stale bread.[1]

19. The demonstration doll.

20. A stove.

The points of special importance to consider when making a poultice are: To have it as light[2]

[1] These need only be provided if desired for, if the pupils are shown how to make a linseed poultice, they should, at any time, be able to make any other kind by following printed or verbal instruction.

[2] A poultice to cover the chest should not be more than half an inch thick, for a weight on the chest may interfere with breathing. A small poultice can be about three quarters of an inch

as possible and as hot as it can be used without burning the patient; to make it of a consistency that will allow of its being spread easily, but not so thin that it will spread of itself and thus run from the covering.

Flaxseed Poultice

Procedure: Put the water to boil (about one and a half pints will be required for a medium-sized poultice for the chest).

Spread a towel on the board and on this lay the oil muslin or flannel; cover the latter with the gauze or muslin on which the flaxseed is to be spread.

When the water is boiling forcibly, add flaxseed to it slowly (do not allow the water to stop boiling), and stir the mixture with the spatula as you do so.

When the paste is just thick enough for some dropped from the spatula to retain its shape for a minute add about one third of a tablespoonful of baking powder or sodium bicarbonate and beat the mixture thoroughly.

Turn the poultice on to the muslin and fill the pan with hot water.[1]

Spread the paste on the muslin to within two inches of the edges as quickly as possible. Turn up the edges of the muslin over the paste.

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thick. When baking powder and sodium bicarbonate are moistened gas (CO_2) is liberated and, therefore if either one is added to a poultice, it tends to make it lighter, and, as gas is a poor heat conductor, to assist in the retention of heat.

[1] If the flaxseed is allowed to dry in the pan the latter will be much harder to clean.

Cover the latter and turn the edges of the cover between the foundation and protector (*i.e.*, the flannel).

Fold the poultice, including the protector, and wrap the towel around it.

Wash and put away the cooking utensils.[1]

Carry the poultice (folded in the towel) and the binder and pins to the patient.

To apply the poultice: Turn back the bedcovers as much as necessary and slip the binder under the part to which the poultice is to be applied

Turn back the nightgown as much as required and if the patient is old or a small child rub some oil or vaseline over the area to which the poultice is to be applied. Cover the part with the towel that is around the poultice.

Test the temperature of the poultice with the back of your hand.

Slip the poultice under the towel, but do not unfold it all at once. Keep raising and lowering it until the patient becomes accustomed to the heat. Notice the color of the patient's skin and judge by this, rather than the patient's opinion, if the poultice is too hot. If it does not cause a very intense redness,[2] spread it out over the part, remove the

[1] If the poultice is boiling when turned on to the muslin and spread quickly and the utensil washed and put away speedily, it is quite possible for this to be done before the poultice becomes cool enough to be applied.

[2] This should always be the guide when making hot applications of any kind, because some skins will blister much more readily than others, and, if a patient is in pain, heat, even in-

towel, and secure the binder; do not, however, fasten it tightly, especially around the chest, as this may interfere with breathing.

Fold the towel and keep it to roll the poultice in when the latter is removed.

A poultice should not be left on longer than three quarters of an hour, for by that time it will be no hotter than the skin and thus of no further value.

To remove a poultice: Take the flannelet protector or a fresh poultice, towel, oil, and pledgets to the bedside. Cover the poultice that is on the patient with the towel, moving the bedcovers and nightgown out of the way as you do so.

Remove the poultice from under the towel and dry the skin by rubbing your hand over the towel.

Look at the skin and, if it is very red, rub some oil over it.

Put on the pad or fresh poultice and when it is in place remove the towel and wrap it around the poultice that is to be taken away.

Mustard Poultice

To make a mustard poultice: Proceed as for a plain flaxseed poultice, but dissolve some mustard in tepid water, using for an adult one tablespoonful of mustard for each cup of flaxseed, and for a child half this amount of mustard, and, just before add-

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tense enough to burn, may be a relief, while on the other hand, some patients will object to even a moderate degree of heat.

ing the baking powder or soda, pour in the dissolved mustard.

For the reasons given on page 183, when mustard is added to anything the temperature of a flaxseed poultice, the counterirritant action of the mustard is much diminished, but it does add slightly to that of the poultice.

Antiphlogistin Poultice

To prepare an antiphlogistin poultice stand the container in a pan of boiling water. Keep the water boiling until the antiphlogistin is considerably hotter than could be borne by the skin (to allow for cooling), stir the antiphlogistin occasionally so that it will be equally heated. Either spread it directly on the skin or on muslin, if the latter, place the uncovered antiphlogistin next the skin, cover the application with absorbent cotton and secure it in place with a bandage or binder.

Remove the poultice when it is cooler than the skin or if it becomes dried. This may not be for several hours.

Bread Poultice

To make a bread poultice: Soak the bread in boiling water until it is soft, beat it with a fork; bring it to boiling point; pour off any water that has not been absorbed; proceed as for a linseed poultice.

Demonstration 21

Application of Fomentations or Stupes

Fomentations, as previously stated, consist of soft material wrung out of boiling water. Flannel and, for the eyes, absorbent cotton are the best materials to use because they hold heat for a relatively long time. Fomentations are most commonly used (1) on the abdomen to cause the expulsion of gas and (2) on the eyes to overcome certain forms of inflammation.

Requisites for abdominal stupes, Method 1:

1. A gas or electric stove and a tray on which to stand it and, if the table on which these are placed will be injured by heat, something (as wood or a folded towel) that is a poor heat conductor to put under the tray.
2. Matches, if necessary.
3. A basin of boiling water.
4. Wadding or a fold of flannelet the size of the abdomen.
5. Two pieces of flannel twice the size of the area for application.
6. A coarse towel.
7. A blanket or shoulder wrap.
8. The demonstration doll.

Requisites for Method 2: The same as for Method 1 with the following exceptions: No blanket and stove are required; the boiling water is to be in a pitcher and the basin empty, but warmed; a binder and safety pins will be needed.

Requisites for fomentations for the eyes: 1. Compresses of absorbent cotton about one and a half inches square, the number depending upon conditions, for, if there is suppuration, the same compress must not be used twice; otherwise, five or six will probably be enough.

2. A towel.

3. A bath thermometer.

4. A pitcher of boiling and one of cold water or whatever solution is prescribed.

5. A dressing basin.

6. A bag or other receptacle for used compresses.

7. If the treatment is to be continued for any length of time, a pail or jar and a stove.

8. If the treatment is for a communicable infection or following operation, gloves. These must be sterile for the latter condition.

These articles should all be arranged in convenient order on a tray.

Abdominal Stupes

Procedure for Method 1: Arrange the stove, light the gas, put on the basin of boiling water.

Double one of the pieces of flannel. Place it in the center of the towel or wringer and put as much of this as envelops the flannel in the boiling water, but leave the ends hanging over the side of the basin.

Put the blanket over the patient's chest and

abdomen and turn down the bedcovers to the groin.

Turn the nightgown up above the abdomen. Cover the latter with the flannelet.

Wring the water out of the flannel by twisting the two ends of the towels in opposite directions. Do this until it is impossible to wring out any more water.

Remove the flannel from the towel; give it a quick shake and pass it (doubled) under the protector (be sure that it is not too hot); spread it out over the abdomen.

Place the other piece of flannel in the towel and this in the boiling water and, after three minutes have elapsed, use this flannel to replace that on the abdomen.

The stupes are to be changed without removing the protector or blanket, but you must raise these slightly each time you make a change to ascertain the color of the skin.

Continue the treatment the length of time prescribed; this is usually twenty minutes.

Dry the abdomen. Sometimes it is covered with wadding or folded flannelet.

Method 2: Prepare the patient as for Method 1, but it is not necessary to replace the bedcovers with a blanket on the upper part of the body, as the covers can be moved from over the abdomen sufficiently without uncovering any other part of the body.

Pass a binder under the patient in position to be pinned around the abdomen.

Put the flannel in the towel or wringer and this, except the two ends, in the basin. Pour the boiling water over the part containing the flannel.

Wring the stupe and apply it as in Method 1. Draw up the sides of the binder and pin it.

Change the stupe every ten or fifteen minutes. The treatment is usually continued until it affords relief.

Eye Fomentations

Procedure: Put a towel under the patient's head.

Pour some water or solution into the bowl and make it the required temperature; this is generally about 110° F.

Put in some pledgets; squeeze the water from one and put it on the eye. Change this in two minutes for a hot one. If there is any suppuration a fresh pledget must be used for each application. Continue the treatment the required length of time and keep the solution at the prescribed temperature.

If both eyes are to be treated use separate bowls and compresses for each eye and squeeze the compresses for each eye with a different hand.

CHAPTER IX

Care of Children

Normal development of children and measures to promote it. Some especially important facts regarding mental development. Requirements for health. Method of taking a baby's temperature. Suitable clothing for an infant. Care of diapers. Demonstration 22: Lifting, weighing and dressing a baby. Reasons for the modification of milk. Care necessary in the preparation of an infant's food and in its feeding. Care of feeding bottles and nipples. Demonstration 23: Preparation of an infant's food and the care of utensils required for the purpose.

Normal Development of Children and Measures to Promote It

Knowledge of what constitutes a normal rate of development is of great assistance in taking care of children and therefore some of the more important facts regarding it will be given here though space will not allow of going into detail.

The table following shows the average **relative weight and height** of normal children at different ages and is a good indication of what the **rate of growth** should be.

Age	*Sex*	*Weight Pounds*	*Height Inches*	*Age*	*Sex*	*Weight Pounds*	*Height Inches*
Birth	Boys	7.5	20.1	5 years	Boys	41.4	41.7
	Girls	7.1	19.9		Girls	40.2	41.3
6 months	Boys	16.0	25.4	6 years	Boys	45.1	44.0
	Girls	15.50	25.0		Girls	43.5	43.5
1 year	Boys	21.2	29.0	7 years	Boys	49.5	46.1
	Girls	20.4	28.2		Girls	47.8	45.8
18 months	Boys	22.8	30.0	8 years	Boys	54.5	48.5
	Girls	22.0	29.5		Girls	52.2	47.8
2 years	Boys	28.5	33.0	9 years	Boys	59.8	50.0
	Girls	27.8	22.7		Girls	57.4	49.6
3 years	Boys	33.5	36.0	10 years	Boys	66.0	52.0
	Girls	31.5	35.5		Girls	63.0	51.7
4 years	Boys	36.4	38.6				
	Girls	35.1	38.3				

During the first five months of life a normal baby, after the first few days, will gain on an average about four and a half to seven ounces weekly and, from this time until it is a year old, about two and a half to four ounces weekly; after this, as can be seen in the table, growth is less rapid.

The development of a normal infant's muscles is about as follows: Those of the neck are usually sufficiently strong to allow a baby to hold its head up by about the end of the third month, those of the back are strong enough to allow the child to sit up unsupported by the seventh or eighth month and soon after this it will be able to creep. As soon as it is, creeping should be encouraged because it will strengthen the muscles involved, namely,

those of the abdomen, buttocks, and thighs. An infant's pen furnishes an excellent means of allowing a child to creep about without getting into danger and one can be made with a packing case that will answer the purpose as well as anything that can be bought. The case should be about eighteen inches high and large enough to allow the child to move about freely. A washable lining should be tacked in it in such a manner that it can be removed when soiled. A baby's clothes must also be considered in connection with muscle development because exercise is **essential for proper development** and the clothing must therefore not interfere with free movement, especially that of the legs.

The bones of the legs and spine are usually strong enough for a child to stand and begin to walk when it is about a year old, but a baby should not be allowed to do so much sooner because, until this time, the bones do not contain enough mineral matter to make them sufficiently firm to bear its weight without bending and, therefore, a baby that is allowed to stand and walk too soon is likely to become bow-legged and to acquire an abnormal spinal curvature. A child's legs are also likely to become bowed if its diapers are so large that they keep the legs in an abnormal position.

The cutting of the first teeth is about as follows:

Names of Teeth.	*Month of Appearance*
2 lower central incisors	6th– 8th
2 upper central incisors	8th–12th

Names of Teeth.	*Month of Appearance.*
2 upper lateral incisors	10th–12th
2 lower lateral incisors	12th–15th
4 anterior molars	14th–16th
4 canine	18th–20th
4 posterior molars	12th–30th

The incisors are the central teeth, there are four in each jaw; the canine are the pointed teeth, there are two in each jaw, one on either side of the incisors; the anterior molars (known also as bicuspids) are behind the canine and the posterior molars behind the anterior.

Delay in the cutting of the teeth much beyond the ages mentioned above is usually indicative of poor nutrition.

The appearance of the second set of teeth is usually as follows:

Names of Teeth.	*Age of Eruption.*
First molars	6th– 7th year
Central and lateral incisors	7th– 9th "
Bicuspids	9th–10th "
Canines	12th–14th "
Second molars	12th–16th "
Wisdom teeth or third molars	17th–21st or even later

A very prevalent, but mistaken, idea regarding the teeth is that **care of the first set** is not important. On the contrary, if these are not cared for in the proper way, bacteria are likely to reach their roots and bring about conditions which will injure the permanent ones; it is to be remembered that, though the permanent teeth do not appear through

the gums until the ages specified above, they begin to form in early infancy. Also, if the milk teeth are lost too soon the shape and condition of the alveoli (cavities through which the teeth come and in which their roots remain) may be so altered that the shape and normal condition of the permanent teeth will be interfered with.

Proper care of the teeth (first or second) implies having them filled if cavities form and brushing them at least twice a day with (in the case of children) a small, very soft toothbrush[1] and a little tooth paste or powder. The brush should be moved backward and forward across the teeth, and also downward on the upper teeth and upward on the lower, in front and behind. It is important that this direction be observed because, moving the brush upward on the upper teeth and downward on the lower tends to make the gums recede from the teeth and to brush foreign substances under the gums and this favors the formation of abscesses in the alveoli. Some of the bad effects that may result from such infection are mentioned on page 147.

Some of the body glands are very imperfectly developed at birth. The lacrimal glands[2] (see

[1] The *prophylactic toothbrush* is a particularly good variety because the brush is curved in a manner that allows it to follow the contour of the jaw, and the bristles are so arranged that they get between the teeth.

[2] The lacrimal glands are situated just above the eyeballs at their outer angles. They secrete the tears. The tears are necessary to keep the anterior of the eyeball moist and free from dirt;

Fig. 44) are not sufficiently developed to secrete tears until the third or fourth month, and, especi-

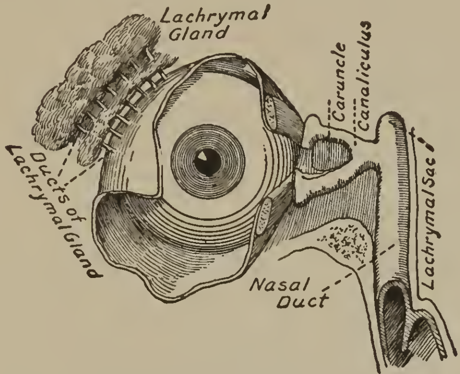

Fig. 44. The lacrimal apparatus of the right eye.

ally during this time, a baby's eyes must be most carefully protected from strong light, dust, and all forms of irritation. During infancy the glands[1] that secrete digestive juices have very limited power to manufacture the enzymes[2] re-

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they pass across the eyeball and, if not evaporated, into small channels that lead into the nose. Ordinarily, we are not aware of this secretion because evaporation just about keeps pace with secretion, but, irritation of the eyes or psychic stimulation of the glands induces such excessive secretion that the tears flow over the cheeks and into the nose. Injury to these glands which prevents them secreting may result in blindness because the consequent dryness of the membrane covering the eyes and its irritation by dust, etc., induces inflammation and thickening which interferes with the passage of light rays to the retina, see page 166.

[1] These are (1) the salivary glands, which discharge their contents into the mouth; (2) glands in the wall of the stomach and small intestine; (3) the pancreas; (4) the liver.

[2] Chemical substances, made by certain animal cells and plants, which assist chemical reactions.

quired for digestion. Only those needed for the digestion of milk are made at first and but small amounts of these. The ferments necessary for the digestion of starch are not secreted in any amount until a baby is nearly a year old and, therefore any starchy food given an infant must be predigested.[1] Also the functioning capacity of some of the glands which make the hormones[2] necessary for metabolism[3] develops slowly and thus infants are very dependent upon chemical substances known as *vitamines* present in fresh milk, and older children upon those in fresh fruit, vegetables, butter, and meat. Vitamines are destroyed by a high temperature and by drying and, therefore, if a baby is fed with sterilized milk it is likely to develop a disease due to defective metabolism such as scurvy or rickets.

The mucous membrane lining the alimentary tract[4] is very delicate and easily irritated during childhood, and foods containing spices and other irritant condiments may cause harmful conditions

[1] The same changes that are produced in starch during digestion can be caused by long-continued cooking and by a ferment, known as *diastase*, which is obtained from malted barley.

[2] Chemical substances, some of which are enzymes, that are absorbed from the glands in which they are secreted by the blood and carried to other parts of the body where they either hasten chemical reactions or stimulate the activity of the organs.

[3] The chemical processes involved in the growth and repair of tissue and in the oxidation of material derived from food which provides the body with heat and energy.

[4] The mouth, throat, esophagus, stomach, and intestines.

in the stomach and intestines. Even the lactic acid in sour milk is too irritant for infants, though it will not harm older children, provided the milk is pure.[1]

The action of a baby's bowels can usually be regulated in three or four months if, as soon as the infant is a week old, it is held on a small chamber *at the same hours each day*, the best times being after the first or second morning feeding and a late evening feeding. For the first few times that this is done it will probably be necessary to induce relatively strong irritation by inserting a small piece of soap in the anus,[2] but, in a day or two, moving the finger around the rectum ought to induce enough irritation to produce the reflexes that cause the rectum to expel its contents. Even this irritation should be discontinued as soon as possible, though, at first, this will mean longer waiting for the reflexes to occur.

The skin, like the mucous membrane, is very easily irritated in early childhood and thus rough

[1] The lactic acid is derived by the disintegration of lactose (the sugar of milk). The change is produced by certain bacteria—which are always present in the ducts leading from cows' udders and thus get into the milk. These germs, however, are not dangerous to human beings, but, unless milk is kept out of contact with anything dirty, it will become infected with bacteria that disintergrate other constituents of the milk and produce substances that are very harmful, but do not necessarily change the taste or appearance of the milk. Also, if milk is not properly cared for, it may become contaminated with germs that, though they do not induce any changes in milk, will cause diseases. Scarlet fever, typhoid fever, and various forms of dysentery have frequently been traced to infected milk.

[2] The external opening of the rectum.

clothing or friction from any source will cause chafing; and wind, the sun's rays and irritant substances, such as impure soaps, and even pure soaps in excess, will cause roughening of the skin. Also, for the same reason, children are very subject to skin diseases.

The special senses touch and taste are already developed when a child is born but a few days elapse before an infant appears to hear and about three weeks before its sight is at all acute.

At birth, **the skull** is relatively large in proportion to other parts of the body and its size increases considerably during the first year and then more slowly up to the seventh year when it will have nearly attained its full growth. During the first few months of life the skull bones are soft and pliable and are not firmly united and, to some extent, the shape of the skull may be modified by the growth of the brain but, later, development of the brain does not affect the shape of the skull.

Actual increase in the size of the **brain** ceases about the same time as the skull but other physical changes in its structure continue for a varying number of years. When a child is born the outer part of its cerebrum,[1] which consists chiefly of what is known as *gray matter*, is smooth but gradually

[1] The upper and front portions of the brain. It is this part of the brain that is concerned with consciousness, that instigates voluntary movements and perceives and interprets sensations; for example, our eye and ears are merely the parts that are stimulated by external influences but it is because these stimuli are transmitted to the brain that we hear and see.

ridges of various depths are formed. This development goes on more slowly in the parts of the brain known as the association areas, which are the parts chiefly concerned with the higher mental activities such as reasoning, judgment, self-control, and will power. Other changes undoubtedly go on in the brain from the time of birth until death; changes which are responsible for memories, habits, etc., but their nature is almost entirely unknown.

Some Important Facts Regarding Mental Development

The first signs of anything like real mental activity are observed when a child is about three months old. Then a normal child begins to hold out its hands to clasp things that attract its attention—it is generally bright things or those which produce sound as watches that do so. Shortly after this it begins to recognize those whom it sees frequently. When it is about a year old, it begins to try to talk and to imitate the acts of others. From the time that it does this its character begins to be formed, and, in some ways, what happens in the brain of a young child in this process and in its results may be likened to the making[1] and use of a

[1] An unmarked plate or cylinder is made to revolve under a stylus and the person making the record sings or speaks, as the case may be, in front of a cone-shaped tube at the bottom of which there is a membrane, or other appliance, to which the stylus is attached and which is vibrated by the waves made in the air by the vocal cords which produce the voice. The stylus cuts lines on the surface of the plate that correspond to the vibrations in the air.

phonograph record. In the making of the record a smooth, unmarked cylinder or plate is marked by a stylus or needle with lines that correspond to the vibrations in the air produced by the (for example) singer's voice and, when the record thus made is again put under the stylus of a phonograph and made to revolve beneath it this stylus, moving in the marks made by the first one, will make the mechanism to which it is attached give rise to the same kinds of vibrations and, consequently, sounds as those by which the lines were produced. Let the cylinder or plate represent the child's brain; the singer, its parents, brothers, sisters, and other companions; the stylus, the nerve impulses that these arouse. The nature of the marks made in the brain are unknown, but, psychologists consider that anything which attracts a child's attention (and thus arouses nerve impulses) will leave an indelible pathway or mark, even as the stylus leaves marks on the phonograph plate. After a child is about five years old, any circumstance that is very interesting or startling to it, or sight, sound, act, or thought that is frequently repeated may make such a deep impression on the brain that it will remain as a more or less distinct memory, but, especially during the earlier years, few marks do this. Nevertheless, the tracing is there and, just as the record reproduces the voice of the singer, so the character of a child is a reproduction of the marks made upon its brain by its associates. However, the results of the marks on the human record

(the character) cannot be as accurately foretold as in the case of the phonograph record because so many people and circumstances, some good, some bad, are concerned in the making of the human one. Also, the child's response to the impressions make a great deal of difference in the final results; if it imitates what it sees and hears the impressions in the brain will be deepened[1] and each repetition will intensify the effect until the grooves become so marked that the nerve impulses evoked by similar thoughts, sights, sounds, etc., are almost sure to pass in them and induce like responses—*i.e.*, to make the child think or act as on previous occasions. It is thus that habits are formed.

A pleasing phonograph record can be made by a good singer, even though there are a few flaws in the plate, though, of course it will not be perfect, but a poor singer could not produce a pleasing record on the most perfect plate. These facts, also, are generally true of the human record. If the protoplasm of the brain is poor, the best examples and training cannot produce the best possible character, but those who understand the natural human instincts and how these can be trained or, on the other hand, perverted by disease and example can do much toward overcoming natural or acquired deficiencies, but poor training, unless

[1] The terms *deepened* and *groove* are used because they so adequately express the permanency of impression and the difficulty, encountered in changing fixed habits, but, as frequently stated, the actual nature of the impressions is unknown.

very strong influences for good are made by some of the child's associates, will, except in rarest instances, spoil the best inherited material.

To summarize: A child's character will depend upon: (1) The nature of the brain protoplasm[1] inherited from its parents; (2) the degree of health in which this protoplasm[2] is maintained; (3) the examples (good or bad) set the child by its associates and the nature of the teaching it receives; (4) the degree to which the child imitates the examples of others and the frequency of seeing, hearing, and doing the same things in the same way; (5) the nature of the things in which an interest is aroused. The characteristics formed in early life can never be entirely eradicated for they are the results of indelible impressions through which nerve impulses pass and control action and thought even as the stylus of the phonograph follows the traces on the record. Some of the impressions remain so vivid that we call them memories, others are so faint that they never call forth any definite consciousness but even these subconscious ones are the foundation of character.

It is the parts or qualities of the cerebrum that govern the emotions (love, dislike, etc.), and the senses (the perception of things seen, heard, felt,

[1] For definition see page 352.

[2] Poor circulation of blood in the brain, abnormal conditions of the blood, the toxins of disease will all have an injurious effect upon the brain, just as they have upon other organs of the body, and a diseased, or even a tired brain, cannot function properly.

etc.) that develop earliest in life. Also, the world is new to the small child and it is very curious and wants to know the why and how of everything and its desire to imitate all that it sees and hears is strong.

After about the sixth or seventh year, the parts of the brain that more especially control judgment, will power, the faculty of associating ideas and experiences that we call reasoning develop more rapidly. The degree to which they will do so depends upon (1) the nature of the brain; (2) the degree to which these functions are exercised; (3) how soon the individual begins to exercise them. For example: The will power that is necessary to concentrate the attention on one's lessons and, later on one's business or occupation will not be developed unless it is exerted to keep the attention fixed when it wants to wander and, if the individual begins to make such effort at the age of nine or ten, she will have less trouble in doing so than if she starts at fifteen, and it will be easier to do it at fifteen than at twenty; after twenty, it will be almost impossible to attain the power of concentration to any great degree if previous efforts have not been successful. It is the same thing with the power of reasoning and all other faculties necessary for success. They must be trained in youth if they are to be developed to the individual's fullest capacity. The way to train them and also the instincts and capacities that develop in early life are taught in psychology.

Requirements for Health

The main requirements for health are: 1. All the fresh air possible. In fine weather in summer, a healthy baby can be taken out of doors when it is a week old; in cooler weather, such as is common in spring and fall, when it is about a month old; in winter, when it is about three months old. In fine weather, the longer children, even infants, are out of doors the better, but the latter must be protected from wind and their eyes from the sunlight. The rooms in which children live must be well ventilated. This, it will be remembered, involves having as free currents of air as possible without creating a draft. The temperature of the rooms should not be below 66° F. nor above 68° or 69° F., except when a child is being bathed when the room should be between 73° and 77° F.

2. Suitable clothing. Children, especially, should never wear tight clothing nor bands. Anything tight around the chest interferes with free breathing movements and then the lower areas of the lungs do not expand as they should and the circulation of blood and air through these parts is sluggish. This diminishes the vitality of the cells and they are less able to resist the action of bacteria if infection occurs. Tight clothing around the abdomen may cause misplacement of the abdominal organs and interfere with the circulation of blood through them. Tight garters inhibit the

flow of venous blood from the legs and predisposes to enlargement of portions of the veins thus giving rise to a condition known as *varicose veins*. In infancy clothing that is too loose is also to be avoided because the undergarments are then likely to become creased and the folds will irritate the skin. The clothing worn next the skin should be of a nature (1) to absorb moisture readily, and thus prevent such rapid evaporation of sweat that the skin is chilled, and (2) to hold air within its meshes and thereby (air being a poor conductor of heat) prevent the too rapid loss of heat from the body. To comply with these requirements the material must be loosely woven and, for the best results, its threads of a loose or fluffy nature. At one time wool was the only material that complied well with these requirements but cotton and silk materials can now be had which are almost as good and are more easily laundried. **The amount of clothing** put on children while they are too young to know when they are too hot or too cold is often wrong. A prevalent, but mistaken, idea is that children should be kept very warm; on the other hand, some people go to the other extreme and in order, so they say, "to harden the child" they clothe it too lightly. Both extremes may be harmful for reasons given in Chapters I and VI. The amount of clothing should be regulated by the conditions of the child's skin, this should be slightly warm and dry and not either hot and moist or cold. What is known as the *Gertrude pattern* is one of the best for

infant's clothing because the several pieces can be put on at the same time and drawn up over the child's feet and there are no bands to restrict breathing and the circulation. In early infancy the skirts should be long enough to cover, but not to drag upon, the feet. Two articles of infants' clothing that need special attention are the abdominal binder and diapers. The binder was formerly generally used until a baby was at least three or four months old in order to support the abdominal muscles, but most physicians now believe that, as a rule, the binder is not really needed after the first two weeks and that, unless there is some special reason for it, a baby is better without it, for, it is quite a difficult matter to put it on tightly enough to support the muscles and to keep it from wrinkling without restricting breathing. The best kind of diapers to use is mentioned on page 226. Some especially important considerations in their adjustment and use are as follows: A diaper must never be drawn too tightly around the body nor be put on in a manner to bend the child's legs nor keep them too far apart. A diaper should be changed as soon as it is wet and it must not be used again, even though only wet with urine, until it has been washed. Cheap soaps must never be used for washing diapers and, even when pure soaps are used, diapers must be very thoroughly rinsed in clear water, for any alkali remaining in the diapers is likely to cause chafing of the buttocks.

3. **Proper feeding.** This is too lengthy a subject to be considered here in detail and only a few especially important points will be mentioned, viz.: Never give a young infant food that has not been prescribed a physician, if it is fed with cows' or goats' milk, the proportion of the constituents must be altered (according to the doctor's directions) to resemble that of human milk. The milk must be kept in absolutely clean utensils, to prevent its contamination with bacteria, and cold, to prevent the multiplication and activity of bacteria that may be in it. It is to be realized that unless milk is boiled it is likely to contain some bacteria, even after it has been pasteurized, and, as previously stated, boiling will destroy the vitamines which are essential for a child's health. Exactly the amount of food and the number of feedings ordered by a doctor are to be given. Even after infancy, food should not be taken between meals. In early youth and during illness, while the quantity of food taken at a time is relatively small, more than three meals a day are required, but these must be given at regular hours so that the stomach will have time to digest one meal and rest before it is given more work. **Foods that should not be given children until they have attained the stated ages** are as follows: Until they are **fourteen years of age,** children should not be given pies and other pastry, highly spiced foods or drinks, coffee, tea, cider, soda water, and other carbonated drinks[1]

[1]Most effervescent drinks owe their effervescence to carbon dioxide.

or alcoholic drinks of any kind. Children **under seven years** of age, should not be given, in addition to the articles just mentioned, pork, ham, sausage, salt fish, dried beef, game, kidney, liver, corn, cabbage, beets, cucumbers, raw vegetables other than greens, fried fish and vegetables, hot bread, griddle cakes, nuts; and even after children are seven years of age, such foods must be given in moderation. Children **between two and four years of age,** in addition to the above articles, must not be given corned beef, raw greens and raw tomatoes, sweet cakes, bananas, uncooked berries and cherries and even other uncooked fruits, except their juices, must only be given in very small amounts, for a considerable portion of their solid material is not digested, and is likely to cause diarrhea, because, as previously stated, a small child's intestinal tract is very easily irritated. Fruit juices, especially orange juice, are particularly good for children because they contain a liberal quantity of the chemical substances known as vitamines which, as mentioned on page 202, aid metabolism. **Appropriate diet for children.**

Between twelve and fourteen months:

6.30 or 7 A.M., 4 per cent. milk, 6 ounces, diluted with 3 ounces of well-cooked, strained cereal gruel.

9 A.M., orange juice,[1] one or two ounces.

10 A.M., same as 6.30 A.M.

[1] When expense has to be considered, the juice of canned tomatoes may sometimes be substituted. Tomatoes, unlike other vegetables, do not lose their vitamines when canned.

2 P.M., beef juice, 2 ounces, or strained chicken, beef, or mutton broth, 6 ounces. Well-cooked and strained cereal jelly, about 3 to 4 ounces with milk.

6 and 10 P.M., same as 6.30 A.M.

Between fourteen and eighteen months:

7 A.M., milk, 4 per cent., 8 ounces.

9 A.M., fruit juice, preferably orange, about 3 ounces.

10.30 A.M., unstrained, but well-cooked, cereal, about 3 ounces, with cream 1 ounce or milk 2 ounces. A piece of dry toast or rusk or zwieback. Milk about 6 ounces.

2 P.M., meat broth, about 4 ounces. Either a small baked potato or well-cooked rice with a soft cooked egg. A small piece of toast. Water, no milk.

6 P.M., same as 10.30 omitting the toast.

10 P.M., milk, about 6 ounces.

Between eighteen months and two years:

This should be the same as the previous diet, with the occasional substitution of finely minced chicken, beef, or white fish for the egg in the 2 P.M. meal and the addition of a small amount (about a level tablespoonful) of mashed and strained carrot or peas or spinach and a dessert of either custard or strained cooked prunes or apple sauce. Also stale bread or toast and milk is added to the 6 P.M. meal, and the 10 P.M. meal is omitted. Very little sugar should be used in cooking fruit for infants and a little salt, but no sugar, should be served with the cereal. If a baby is accustomed to eat things without sugar it learns to like them in

this way and too much sugar is one of the common causes of digestive disturbances in childhood. Water should be given between meals.

4. Prevention of constipation. Important measures for doing this are: Training the infant to use the chamber as described on page 203 and, in later life, going to the toilet at a regular hour, soon after breakfast being a good time. Going to the toilet as soon as the desire to do so is felt. Nothing is more likely to produce constipation than failure to do this for, though defecation is to some extent under voluntary control, the actual act is a reflex one produced by nerve impulses that are aroused by irritation of the rectum by material entering it from the upper part of the bowel and this reflex becomes less prompt and powerful if it is constantly interfered with by conscious effort, as when one resists the desire to go to the toilet. If further treatment is needed for infants, a doctor should be consulted, older children and adults should eat fruit, coarse cereals, and vegetables, and take all the exercise possible. Constipation is very harmful because when food residue stays too long in the intestine it is decomposed by bacteria into substances that may be very harmful to the body.

5. Training the body to react to differences in temperature as described in Chapter VI and on page 221.

6. Freedom from irritating conditions such as are induced by adenoids, eyestrain, and other remedial body defects.

7. Care against infection by bacteria. **To avoid the contracting or causing infections children should be taught to observe the following precautions:** Not to spit on the ground; to hold a handkerchief in front of the face when sneezing or coughing; not to use public drinking-cups or towels; not to touch the spout of a drinking-fountain when taking a drink; not to wet the fingers in the mouth before turning the leaves of a book; not to put the fingers, money, or any unnecessary article in the mouth; not to take a bite of another child's candy, etc.; not to eat anything that looks dirty or upon which flies have been seen to alight; to wash food and raw vegetables before eating them.

8. Sufficient rest and sufficient exercise. Exercise is of primary importance for maintaining normal muscle tone and circulation of the blood. Therefore, as previously stated an infant's clothing and surroundings must not be allowed to interfere with its movements. A certain amount of crying, about thirty or forty minutes a day, is good for a baby, it exercises its lungs and other parts of its breathing apparatus. The cry of a healthy baby will be loud and strong. When a baby cries it should not be petted and taken up or it will form the habit of crying and do so more than it ought to. If it cries too long or frequently means should be taken to ascertain the cause.

The nature of a child's cry often gives some clue to its cause, for example, if the child is in pain, the cry is sharp and is usually accompanied with draw-

ing up of the legs and distortion of the features; a fretful, moaning cry, indicates illness; a strong fretful cry accompanied with sucking of the fingers usually indicates hunger; but, if it is not time for a feeding the child should not be indulged. If it is frequently hungry, however, the doctor's advice should be sought as it may not be getting enough food.

If a child is fretful and does not sleep properly or shows other signs of distress it is well to **take its temperature** and an infant's temperature is best taken by rectum. The means of doing this can not be demonstrated in class but, if the method of taking it by mouth is known, the following instructions can be easily followed:

Shake down the mercury, lubricate the bulb with vaseline, insert it gently in the rectum for about one inch pointing it, if the child is lying on its back, slightly backward and, if it is lying face downward, slightly forward. Hold the thermometer in place for three minutes. Fig. 45 shows the way in which a child is usually held when taking its temperature as, when it is in this position, its movements are easily restrained.

Demonstration 22

Lifting, Weighing, Bathing, and Dressing a Baby[1]

Equipment: 1. A large doll in a crib.

2. Scales.

[1] This description is for a baby over two weeks old. An infant younger than this should be bathed by a nurse or, if this is impossible, following the directions of a doctor or nurse.

3. A wrap, a square (about one yard) of flannelet is a good kind.

4. Two soft warmed towels.

5. A rubber apron.

6. A bath thermometer.

7. A small tub about two thirds full of water with temperature of, at the time of use:

For an infant under three months.......	95° to 100° F.
For an infant three months and upward..	90° to 96° F.
For an infant one year.................	85° to 90° F.
For an infant two years................	75° to 80° F.

8. Soap or, better, a small basin of hot soapsuds. *Only the purest unscented soap, such as Castile, should be used, cheap soaps and cold process glycerine soaps are likely to contain free alkali which irritates a baby's skin.*

9. Pure unscented toilet powder in a can with a perforated cover. *Powder puffs should never be used.*

10. Clothing[1] consisting of: A binder (*this should be used in class in order to learn how to put one on though, as previously stated, binders are not generally used after a child is about two weeks old*) a shirt, a flannel petticoat, except in warm weather; a white petticoat, if desired; a dress; stockings; diapers, a small one of stockinet (about fourteen inches square for a small baby) and a larger one (about half to three quarters of a yard square) of heavier material, for example, Canton flannel.

[1] To the Teacher: It is well to have samples of good and poor styles of clothing to show the pupils.

11. Safety pins.
12. Scissors, needle, thread, and thimble.

Points of special importance to remember when lifting, weighing, bathing, and dressing a baby: Do not startle an infant by lifting it quickly and suddenly when it is asleep.

Do not undress a baby in a room colder than about 75° F.

Always support a young baby's neck and back while lifting and holding it.

If possible weigh a baby about once a week for the weight is, as a rule a good index of its condition.

Formerly it was thought that the baby should not be exposed while being weighed and bathed, but it is now believed that, if the room is about 75° F. and the baby is healthy, it is well to expose the body to the air for a short time, but a wrap should be put about the baby after it is undressed and, though it may be thrown back while the child is in the scales and being bathed, etc., it must be kept where it can be drawn about the baby if the latter appears cold. The weight of a wrap that is about a baby while it is being weighed must be ascertained and deducted from the total weight.

Keep the tub used for bathing an infant exclusively for that purpose.

Have the temperature of the water correct. To have it unnecessarily hot is bad for a child for reasons given in Chapter VI, and temperatures lower than those mentioned on page 219 for the given ages may also be harmful because a small

child's system will not have been trained to react to cold. After a child is about two or three years old it is well to complete the bath with a spray of cold water—about 70°–65° F. While using the spray have the child stand in water about 80° F. and, for the first few times spray only part of the body for a minute or two and do it in a manner to amuse the baby, for if a child is frightened or allowed to feel cold, it is likely to dread the spray and cold baths, which is to be deplored, because, for reasons given on page 95, they are a great help in maintaining good health. Having a floating toy or two in the bath water is a help in making a child enjoy its baths.

While bathing a baby notice its general condition, look especially for signs of chafing and at the condition of the eyes and mouth. Formerly it was customary to wash the eyes and mouth with boric acid solution, but now, most physicians consider this not only unnecessary, but injurious and believe that, when these organs are in a normal condition, washing *around* the eyes with a clean wash cloth and warm water when washing the face is all the cleansing that the eyes require and that the mouth seldom, if ever, needs any cleaning until the teeth appear. Of course if a baby has fever or digestive disturbances, just as in the case of an adult, the mouth will become dry and coated, and if anything unclean, for example a soiled bottle nipple, is put in a baby's mouth a condition known as *thrush* is likely to develop. Thrush is caused

by a very prevalent microörganism that multiplies rapidly in decomposing milk and sugar substances. The first signs of the infection are white specks in the mouth and increased redness of the membrane. In such cases the mouth must be washed often enough to keep it clean, but a doctor's advice should be sought.

Observe the following precautions when washing a child's mouth: Wash your hands thoroughly. Use only clean, soft material, such as absorbent cotton (gauze is too rough). Do not make this moist enough for the liquid to be swallowed for even though this is not poisonous it is very undesirable for material from an infected mouth to enter the stomach. Use the utmost gentleness when washing the mouth for more than the slightest degree of rubbing is likely to break the surface of the membrane and a very serious deep infection may follow. Very frequently all that is required to clean the interior of the mouth is to put a wad of moistened cotton in the mouth and the sucking movements that the child then makes will cause sufficient rubbing. To clean the interior of the cheeks, outer border of the gums and, if necessary, within the mouth, wind a piece of cotton around one end of a thin strip of whalebone, as directed in Chapter IV, or your little finger. Moisten the cotton and move it about the mouth very, very gently. Change the cotton as often as necessary, do not reinsert a soiled piece in the mouth. Though the washing is to be done gently, it must be thorough.

Fig. 45. Position in which to hold an infant when taking its temperature.

When dressing a baby do not put any safety pins, knots, or buttons where the child will lie upon them and use as few of such things as possible. Never put a straight pin in a child's clothing and use safety pins only for the diapers.

Procedures: See that the temperature of the room is about 75° F.

Arrange the scales and articles required for the bath and dressing where you can reach them easily. If the weather is cold have them near a radiator if possible and hang the wrap and towels on this that they may be warmed.

Weigh the wrap.

Put on your apron; take the weighed wrap and lifting the baby gently, so as not to startle it, put the wrap[1] around it with the opening on the side that will be nearest you when you sit with the baby on your lap.

Undress the baby. While doing so sit with it lying in your lap and draw its clothing off over its feet.

Put the wrap in the scales and the baby on the wrap and note the weight. Deduct the weight of the wrap from the total.

Hold the baby in your lap with one side of the wrap covering your apron and the other ready to be drawn around the child if necessary.

See that the temperature of the bath water is accurate.

[1] The wrap is put around the baby so that when it is undressed it will not come in contact with your rubber apron.

Proceed with the bath. An infant may be bathed in the lap or sprayed or, after it is three weeks old, a healthy infant may be put into a small tub. As previously stated, it is rarely necessary to use soap more than once a week. Wash first the face, head, and neck and then in turn the arms, chest, legs, back, buttocks, and between the legs. Pay particular attention to the eyelids, ears, buttocks and all parts where two surfaces of skin come together. **When bathing a baby in your lap,** dry each part before proceeding to another and, when the bath is completed, draw the wrap around the child and by gently rubbing over the former make sure that there is no moisture on the body. Then put your left arm under the wrap in a manner to adequately support the baby, draw the dry warm towel over your lap, discard the wrap and put the baby down on the towel. **When putting a baby into a tub bath,** have your left wrist and hand under its head and shoulders with your thumb and little finger extending into the axillæ. Hold the legs with your right hand. Keep your left hand in the same position during the bath and wash with your right hand. Do not keep the baby in the tub more than two or three minutes. To lift it, take hold of the legs in the same manner as when putting it into the tub; raise it from the water and hold it for a second or two above the tub, then put it on your lap and bring the wrap around it; dry it by gently patting over the latter and with one of the warm towels. Then replace the wrap with a dry towel

as when giving the bath in the lap. The method of giving a spray bath is so dependent upon the kind of apparatus used that no adequate description can be given.

Powder the baby if necessary. To do so, shake a little over the parts where it is required and then rub it gently with your hand. The powder is used to dry the skin and thus prevent chafing and, except in hot weather, all that is usually required is a little between the buttocks, in the groins and axillæ and some babies do not even need this much.

Dress the baby: If a binder is to be used[1] put it around the abdomen, draw it firmly enough to keep it from wrinkling, but not so tightly that it will interfere with breathing. Sew it in front with coarse thread.

Put the shirt on; if it is closed, draw it upward over the feet. To get the child's arms into the sleeves, put the fingers of your right hand up through a sleeve and, taking hold of the child's hand, draw its arm down through the sleeve.

Fold a small diaper cornerwise, place it under the child's buttocks with the longest side at the waistline, bring the three corners together in front and pin them with as small a safety pin as can be used conveniently. Fold a large diaper in the same manner as the small one, pin it around the waist and, with the small one, to the tab on the shirt that is intended for the purpose. Do not

[1] The objections to its use when not needed were mentioned on page 212.

bring the ends of the large diaper up between the legs.

If possible arrange the remainder of the garments one inside the other so that they can be put on at

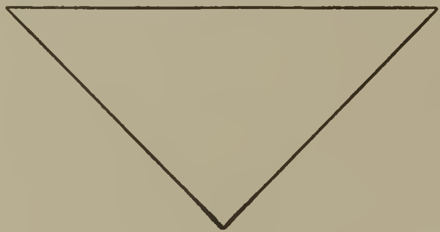

Fig. 46. Shape of folded diaper.

the same time. Draw them up over the legs and draw the arms into the sleeves in the manner described for the shirt.

Demonstration 23

Preparation of an Infant's Food. Care of Bottles, Nipples, and Other Utensils

Articles required: 1. Two bottles of 4 per cent. milk.[1]

2. A prong for removing the cover.

3. Nursing bottles. The standard graduated Hygeia nursing bottle is the best type, for it can be easily cleaned. There should be a bottle for each feeding that the baby is to have in the twenty-four hours.

[1] Milk containing 4 per cent. fat. This is the amount usually contained in good cow's milk in temperate climates.

4. A basket with a handle in which to stand the bottle. There are special wire baskets to be had for this purpose, but a wicker one that has fairly straight sides will answer or, if the milk is not to be pasteurized, a deep dish or bowl can be substituted.

5. A granite pot large enough to hold the basket of bottles.

6. Absorbent cotton or rubber corks[1] to fit the nursing bottles.

7. A Chapin dipper.

8. An enamel quart pitcher.

9. A thirty-two ounce graduated glass measure or, if this cannot be obtained a small measure and an extra enamel pitcher.

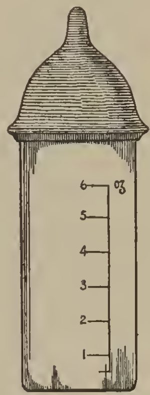

Fig. 47. Ideal nursing bottle.

10. A teaspoon.

11. A glass rod[2] about two inches longer than the glass measure.

12. A funnel to fit the nursing bottles.

13. A dairy thermometer, if the milk is to be pasteurized.

[1] Ordinary corks are so porous that germs can pass through them. Sterile absorbent cotton makes the best stopper but is expensive and rubber corks answer the purpose if they are washed and boiled daily.

[2] A glass rod is better than a spoon for stirring the milk mixture because a spoon that has a small enough bowl to fit into the measure will not have a long enough handle to make it unnecessary for the hand to be within the circumference of the measure. Such rods are inexpensive and can be bought at almost any drug store.

14. Some sugar, either cane sugar or lactose.[1]

15. A pitcher of boiled water or cereal water.[2]

16. Boracic acid powder.

17. Nipples, preferably one for each bottle.[3]

18. A small saucepan and 2 small covered jars for the nipples.

19. A clean apron.

20. A piece of clean white oilcloth such as is used for covering tables, or, if this cannot be obtained, a clean towel.

21. Two clean towels.

[1] Lactose is the natural sugar of milk and is prepared from it—it is not as heavy as granulated cane sugar, two tablespoonfuls of cane sugar and three of lactose weighing an ounce. This difference in weight must be remembered if necessary to substitute one sugar for another when preparing a feeding.

[2] Specially prepared flours are generally used for making cereal waters for infants, as, if the untreated grains are used they must be cooked for from three to six hours, the reasons for this were mentioned on page 202. To prepare a cereal water, make the amount of flour prescribed into a paste with a little cold water then, add (slowly to prevent lumping) the amount of boiling water required, stirring the mixture constantly as you do so. Cook this in a double boiler the length of time specified; it will be necessary to stir it constantly for a short time and occasionally afterward. If the amount is reduced during cooking, add enough boiling water to replace that lost, *e.g.*, if the doctor told you to use two tablespoons of flour to a quart of water, if there is less than a quart of cereal water at the completion of cooking, add enough boiling water to make this amount, otherwise, there will be more flour in the water than the doctor intended and it may be more than the baby can assimilate.

[3] The reason for this is that there is likely to be lack of care in the cleaning of a nipple when it has to be done after each feeding.

22. A bottle-brush, for cleaning the bottles, and a small hand-brush for cleaning the nipples.

Fig. 48. Brush for cleaning bottles.

Points of special importance in connection with an infant's feeding: A young baby should not be given any food that has not been prescribed by a doctor.

In preparing the food, the measurements must be absolutely correct.

Everything used for the preparation must be perfectly clean.

The milk should be kept in the same compartment as the ice and surrounded by the latter, nothing else should be placed near it. If there is not ice, each bottle should be rolled in a layer of wet cheesecloth and stood in a pan containing water and this placed in a draft.

If the milk is not certified or pasteurized[1] when obtained—it should be pasteurized after it is prepared and, after this is done, it must be cooled rapidly.[2]

[1] Milk obtained from dairies that are under the supervision of the Board of Health and comply with certain rules made by the Board which gives them the right to label their milk "Certified."

[2] So-called after Pasteur one of the first bacteriologists to show that spoiling of food was due to microörganisms. Pasteurizing milk differs from sterilizing it in that the milk is exposed to a lower degree of temperature and for a shorter time when it is pasteurized than when it is sterilized, and thus fewer changes are caused in the milk, but, though most of the bacteria likely to be in the milk are killed by the lower temperature, what are known as spores, are not and these, if the milk remains warm, will de-

Fresh food must be prepared each day.

The food for each feeding should be placed in a separate bottle and, if any is left, it should be thrown away. Occasionally, even when the baby, food, and nipple are all right, a baby will not take the whole of a feeding, but when this happens it should be ascertained if there is any avoidable cause; two common ones are: (1) too small a hole in the nipple; (2) the baby sleeps while it is being fed.

Bottles and nipples should be rinsed in (1) cold water[1]; (2) hot water as soon as they have been used. Each bottle should be kept filled with water until it is cleansed. It is well to clean all the bottles at the same time and, as they should be cold when the milk is put into them, this is best done in the evening, if, as it usually should be, the milk is prepared in the morning. However, some people, for convenience, prefer to have two sets of bottles so that those used one day can be cleansed at the same time as the utensils used for the preparation of the milk. The bottles should be washed in hot soapsuds, using a brush, and then very thoroughly

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velop into bacteria. Milk is a particularly favorable food for bacteria and they develop very rapidly in it unless the milk is kept at a temperature that is unfavorable for them, *i.e.*, below 50° F.

[1] Milk contains a substance called *albumin* which is coagulated by heat and, if hot water is used before all trace of the milk is removed, this makes the glass look smeared and it is difficult to remove.

rinsed and scalded with hot water.[1] They should then be inverted in the basket or a bowl so that they will drain, and this stood in the pot and covered. Sometimes, especially in summer time, it is well to boil the bottles. To do this, fill the pot sufficiently to cover the bottles with cold water[2] and let this come slowly to boiling point and boil for at least five minutes. Let the water cool and then pour it off and invert the bottles to drain.

It is well, if possible, to have as many nipples as bottles and to rinse each nipple after use in (1) cold and (2) hot water and then drop it into a covered jar and wash the entire supply when washing the bottles. Wash them with a brush using first soapsuds and then hot water. Wash both sides of the nipples. To turn a nipple, put the end of your finger against the point of the nipple, push it upward and, at the same time, turn the open end of the nipple down over your finger. After they are washed, tie the nipples in a square of cheesecloth and boil them for a minute—have the water boiling before you put the nipples in and do not boil

[1] Always let the hot water run over as well as into the bottles so that all parts of the glass will be expanded at the same time by the heat and then the glass will not break.

[2] If the bottles are not in a basket something such as a piece of wood or a folded towel should be placed between them and the metal, because metal does not expand as readily as glass under the influence of heat and it absorbs heat more rapidly than glass and for these reasons, it is likely to crack the bottles if it touches them.

them longer than necessary, as the heat softens the rubber. Pour off the water at once, expose the nipple to the air for a few minutes (in the pan in which they were boiled) that they may dry and then empty them into a dry jar that has been boiled and can be tightly covered. After they have been boiled the nipples must not come in contact with anything but the pan in which they were boiled and the sterile jar.

If there is only one nipple for use, wash it at once after use and drop it into the solution. Boil it once a day.

If rubber corks are used boil them at the same time as the nipples.

Especially important points to remember regarding the care of nipples are: Always wash both sides of a nipple.

After a nipple has been washed do not touch the part that is to go in the baby's mouth.

Always keep at least one new nipple in the house, for the hole in a nipple may become enlarged during the cleansing.

Reason for and nature of the modification of milk for infants: The milk of each species of animal is suited to the requirements and digestive capacities of its young and, as the young of the lower species of mammalia grow more rapidly than the human infant, the milks of these species contain more solid matter than human milk; also, there is some difference in the proportion of the various solids as can be seen in the following table:

Differences between Human and Cow's Milk

	Human Milk	*Cow's Milk*
Protein,[1]	1 to 2 per cent.	4 per cent.
Fat,	3 " 4 " "	3 to 4 " "
Lactose,[2]	6 " 7 " "	4.5 " "
Mineral,	1 " 2 " "	.7 " "
Water,	87 " 88 " "	86 to 87 " "

It is because of these differences that milk obtained from cows or other animals has to be modified[3] before it is given to a young infant.

The modification of milk generally consists in the addition of water and carbohydrate[4] and sometimes lime water,[5] and, for some infants, changing the relative proportion of protein and fat.

The carbohydrates generally added to milk are

[1] There are a variety of substances in foods that contain nitrogen and are classed as proteins. Two kinds found in milk are albumin (this is coagulated by heat and appears as a scum on the top of milk when it is heated) and caseinogen (this is curded by acid and rennin).

[2] The sugar in milk.

[3] Changing the proportions of the constituents of milk from the lower animals to resemble those of human milk is termed modification. There are however other differences between the milks that cannot be altered; two important ones are: (1) if a child is nursed it receives sterile milk, but other milk will only be sterile if raised to a temperature that causes other changes in it; (2) human milk is likely to contain substances that protect the infant from infection by bacteria.

[4] The principal foods classed as carbohydrates are: Starches, sugars, cellulose (*i. e.*, the fibrous portion of fruit, vegetables, and other parts of plant) gums.

[5] Lime water inhibits the formation of hard curds in the stomach and increases the body's supply of calcium, but it also tends to retard digestion in the stomach and, therefore, it should not be used unless ordered by the doctor.

either lactose or granulated sugar, and specially prepared starch in the form of cereal water. As previously mentioned starch that is subjected to a high temperature or the action of certain ferments will undergo the same changes as those induced by digestion.

The change in the relative proportions of protein and fat is generally procured in either of two ways: (1) cream is added to whole milk[1]; (2) the milk is allowed to stand until the cream rises to the top and then the number of ounces specified by the doctor are removed. The smaller the amount of so-called *top-milk* removed, the more fat and less protein will it contain because it is principally the fat of milk that rises to the top.[2] For examples, if you take the upper nine ounces from a bottle of 4 per cent. milk that has stood long enough for the cream to rise it will contain 11.5 per cent. fat and approximately 3.0 per cent. protein; while if you remove 16 ounces you will have a top-milk containing 7 per cent. fat and approximately 3.2 per cent. protein.

The easiest accurate way to remove cream from a bottle of milk is with a Chapin dipper (see Fig. 49). This can be bought at almost any drug store. The method of using it is described later.

Care in the feeding of an infant is as important as care in the preparation of its food.

[1] Milk from which none of the constituents have been removed.

[2] Milk containing 4 per cent. fat. This is the usual fat content of good milk.

The points of special importance to observe in the feeding are: Make milk lukewarm before giving it to an infant, but do not warm it until it is required because germs multiply rapidly in warm milk. For this reason milk that is kept warm for a number of hours in a thermos bottle may be very injurious to a child. **To warm the milk:** remove the stopper from the bottle, put a nipple on the latter, *being careful not to touch the part that is to go in the child's mouth*, stand the bottle in a pan containing enough hot water to reach beyond the upper level of the milk. **To test the temperature** of the milk, invert the bottle and allow a few drops to fall on the front surface of your wrist.[1]

Ascertain if the hole in the nipple is the right size at the same time as you test temperature. If it is, when the bottle is inverted, the milk will flow continuously in slow drops, but not in a continuous stream. If the hole is too small enlarge it by inserting a heated knitting needle in the hole. If the latter is too large the nipple should be discarded or, if you have not a substitute, take special care to regulate the flow of the milk by the slant of the bottle.

Always hold the bottle at a slant that will just allow the infant to get the milk without undue effort.

Do not allow a baby to sleep while it is being fed. This will be more easily prevented if you hold it in your lap during the process.

[1] The arm is more sensitive to changes of temperature than the hand.

Do not allow a baby to suck the nipple after the milk is finished, for by doing so it will get air into its stomach and intestines and some physicians believe that all undue sucking of nipples, or of the fingers, or of pacifiers, by causing excessive movement of the soft tissue at the back of the throat, is conducive to the undue development of this tissue and consequently of the growth of adenoids.

After a feeding, change the infant's diapers if necessary and then put it in its crib. A baby should never be played with or rocked after a feeding.

Especially in hot weather, infants need water between feedings, and water that has been boiled for three minutes should be kept for the purpose. A fresh supply should be prepared daily and kept in a tightly corked bottle that has been boiled. The water should not be actually cold when it is given to the child and nothing should be added to it unless prescribed by a doctor. The baby will usually take as much as it needs. Restlessness is apparently often due to thirst for a baby is frequently quieted when given a drink.

Procedure in preparing a feeding: Roll up your sleeves above the elbows and scrub your hands and arms.

Put on a clean apron.

Arrange your equipment: Spread the oilcloth where you are to work; place the basket with the inverted bottles at the left side; the pitchers and

bottle of milk in the center; the measures, spoons, dipper, and other supplies at the right.

Place your prescription where you can read it easily.

Take the cover from the milk bottle with the prong.

If the prescription calls for top-milk, remove the number of ounces required.

The two following prescriptions, can be used for class:

℞ $1\frac{1}{2}$ ozs. sugar; 12 ozs. of 7% top-milk; 20 ounces of boiled water.[1] Of this give 7 feedings of 4 ounces each.

℞ $1\frac{1}{2}$ ozs. sugar; 30 ozs. of 4% milk; 12 ozs. of boiled water. Of this give 6 feedings of 6 ounces each.

(The only difference in procedure in filling these two prescriptions is in the preparation of the milk.)

Put the amount of sugar required into the graduated measure and a little of the water. Stir the sugar until it is dissolved.

For prescription 1, remove the upper sixteen ounces from a bottle of milk. To do this open the dipper as shown in Fig. 49, and lower it into the cream until its upper edge is *just below the upper surface of the cream*, then draw up the lower part of the dipper until it is tightly closed; raise the

[1] Plain water used to dilute milk for infant feeding should be boiled, for three minutes, long enough before it will be required to be absolutely cold when added to the milk. Recipes for preparing cereal waters are printed on the packages of the cereal sold for this purpose. These also must be cold when used.

dipper and, holding it over an empty pitcher, open it again. The Chapin dipper holds just one ounce and therefore this procedure will have to be carried out sixteen times, but, after the first ounce is removed, it will not be necessary to open the dipper when you lower it into the cream. Stir the top milk with the glass rod until it is thoroughly mixed.

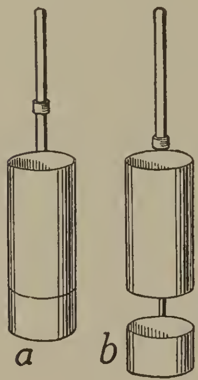

Fig. 49.
Chapin dipper.
(a) *Dipper closed*
(b) *Dipper open*

For prescription 2, empty the whole bottle of milk into a pitcher and then either stir it well or else pour it back into the bottle and again into the pitcher, for it is important that the cream and milk be thoroughly mixed.

Hold the graduated measure with the line of the amount you require on a level with your eyes (be sure to notice how high the sugar solution comes and allow for this), pour in the milk and then the remainder of the water.

Stir the mixture very thoroughly and then pour it into the bottles; *for prescription 1*, pour four ounces into each of seven bottles, and, *for prescription 2*, six ounces into each of six bottles.

(When lime water is prescribed it can be added at any time before the final stirring. The ingredients are usually mixed in the order given above so that (1) the sugar may be thoroughly dissolved before the milk is added; (2) adding the bulk of the water last is

of help in getting the ingredients thoroughly mixed. It is important that the mixture be well stirred just before it is put into the bottles, as otherwise the feedings may not all contain the same amount of cream.)

Plug the bottles tightly with absorbent cotton or rubber corks and place them in the basket. If the milk is not to be pasteurized put the basket and its contents in the refrigerator amidst the ice.

If the milk is to be pasteurized have an extra feeding bottle and put some milk or water into it and a dairy thermometer, as in Fig. 50. Stand the basket of bottles in the pot and pour enough cold water around them to come a little above the level of the milk in the bottles. Put the pot on the stove and let the water heat slowly until the liquid in the extra bottle is 140° F. Then turn out the flame, but watch the thermometer and, if necessary, apply heat again. The temperature of the milk is to be kept at 140° F. for thirty minutes.

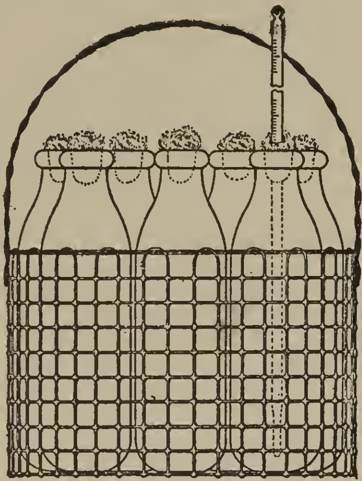

Fig. 50. Milk bottles arranged in basket for pasteurization.

At the conclusion of the thirty minutes remove

the basket of bottles, stand it in tepid water and cool this as quickly as possible without breaking the bottles. This can be done by, at short intervals, adding small pieces of ice or cold water to that surrounding the bottles.

As soon as the bottles are cool enough put them in the refrigerator.

Clean and put away the equipment: Wash all the utensils in (1) cold water; (2) hot soapsuds; (3) clear hot water. Let the water run into and over them; this is especially necessary in the case of the glass utensils in order to keep them from breaking. Invert the utensils to drain and when they are dry put them away. It is well if possible to keep these utensils solely for the preparation of the milk and either in a covered box or rolled in clean towels. If this is not done they should be scalded before use. The method of cleaning the bottles and nipples has been already described.

CHAPTER X

Bandaging

Uses, kinds and sizes of bandages. How to make bandages. Points to remember when bandaging. Demonstration 24: Circular, spiral, spiral reverse, and figure-eight bandages. Bandages for the leg, foot, heel, knee, arm, fingers, shoulder. Tailed and handkerchief bandages and slings.

Equipment: Bandages of different widths.

A bandage roller if possible.

Pieces of muslin for tailed and handkerchief bandages and slings.

Bandages are used chiefly: To keep surgical dressings, splints, poultices and the like in place; to control the circulation of blood in a part when there is hemorrhage or swelling; to limit motion and to afford support.

Gauze (cheesecloth) and muslin are **the materials most commonly** used for bandages, but various others are also employed; *e.g.*, crinoline impregnated with plaster which, when applied, constitutes what is known as a *plaster cast*, flannelet, Canton flannel, and rubber, also bandages of a special loose-meshed material can now be bought, at stores dealing in surgical supplies, that are particularly good for affording support to weak ankles

and making pressure upon varicose veins and swollen parts. Gauze bandages are usually preferred to others for keeping surgical dressings in place, because they are lighter and cooler and more easily adjusted than those of other materials, but the gauze is not firm enough to be used when pressure and support are necessary.

The average widths of bandages used for different parts of the body are: For the fingers, one inch wide; for the head, arm, and foot, two to three inches, according to the size of the patient; for the thigh and trunk, three to four inches; for the heel, three inches.

Making bandages: When bandages are made in large numbers they are rolled and cut by machinery but, for individual use, the material for a bandage can be cut or torn and rolled by hand. However, it must be properly rolled or the bandage will be difficult to adjust. The points of special importance are: The material must be smooth (without wrinkles) and tightly rolled and the selvage and ravelings removed. The selvage is removed before and the ravelings after the material is rolled. The reason for the removal of the selvage is that it does not stretch as much as the rest of the material and thus increases the difficulty of getting uniform pressure. **To roll a bandage by hand** fold one end of the strip of material upon itself several times until a small, but firm, roll is formed. Then hold the free part of the strip between the thumb and index fingers of the right

hand, hold the roll with the thumb of the left hand on one end and the first finger on the other, and rotate the roll until the bandage is completed.

Fig 51. Rolling a bandage by hand.

Items of importance to remember when bandaging are: (1) A bandage must be put on tightly enough to insure its remaining in place, but it must never be so taut that it causes pain or, except when prescribed for the purpose, interferes with the circulation. (2) When there is a wound or acute inflammation a bandage is generally put on particularly loosely, but, when it is intended to afford support or pressure, it is usually put on as tightly as possible without causing the effects mentioned above. In such case it is particularly important that it be put on in such a manner that the pressure

is uniform over the entire part that is bandaged. That it may be so, no one turn of the bandage must not be tighter than another and each turn must overlap the other an equal distance. The first turn taken when starting the bandage is particularly likely to be made too tight unless care is taken to avoid it. (3) When bandaging a limb, the toes or fingers are left uncovered if possible, even when they are not to be moved, because their condition shows if the bandage is too tight. Indications that it is are a deep red or bluish color, and coldness of the skin. This precaution is especially important when there is inflammation because, even when the bandage is loosely applied the swelling in the part may increase and make it too tight.

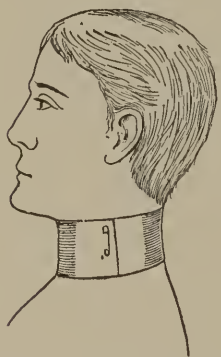

Fig. 52. Circular bandage.

When bandaging, hold the bandage roll side upward in your right hand, begin to bandage at the distal end of the part to be covered and work upward. Always pin or tie a bandage so that the pin or knot will not come in contact with any part of the patient's body or where he will not lie upon it. To tie a bandage, tear a few inches of the material, twist the two ends around each other, pass them in opposite directions around the limb and then tie them over the twist.

The forms of bandages in most common use are what are known as the *circular, spiral, the spiral reverse, the figure of eight and the spica.*

The circular bandage consists of two or three turns made around a part, each turn covering the preceding one. (See Fig. 52.)

The spiral bandage can be applied only to parts of about uniform circumference. It consists of

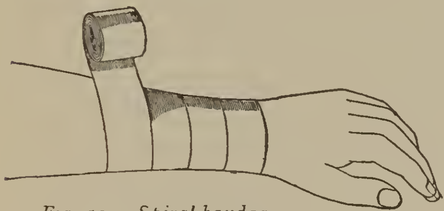

Fig. 53. Spiral bandage.

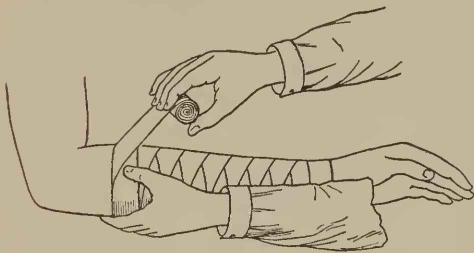

Fig. 54. Spiral reverse.

Fig. 55. Forearm with simple spiral below and the reverse above.

circular turns, each one made higher than the preceding one, but overlapping it about one half its width.

The spiral reverse is similar to the spiral band-

age, but, in each turn, the material of the bandage is reversed, *i.e.*, turned over upon itself. To make the reverse, place the thumb of the left hand at the point where the reverse is to be made, pronate the right hand (in which the roll is held) and thus double the bandage upon itself, as shown in Fig. 54, and make sufficient traction on the bandage to draw the turn into place. Make each reverse directly above the preceding one. By thus reversing the bandage the turns can be adjusted to the contours of the body; this makes the spiral reverse a particularly suitable bandage for the legs and arms.

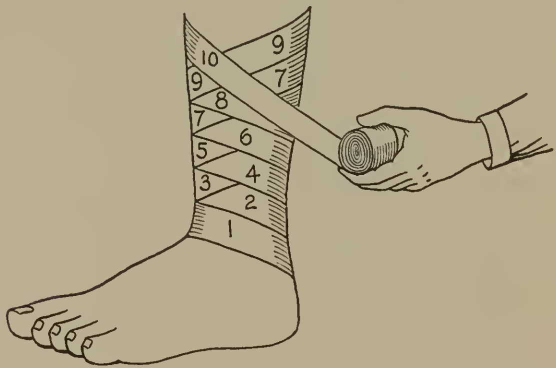

Fig. 56. Figure-eight bandage.

The figure-eight bandage consists of a series of oblique turns alternately ascending and descending and crossing each other in such a manner that they form the figure eight around the part. This forms the basis for many special bandages, such as those used on joints.

The recurrent bandage consists of a series of turns passed back and forth across the part to be bandaged, each turn overlapping the other one half its width. The ends are secured by a circular turn around them. The recurrent bandage is used chiefly to retain dressings in place on the head, ends of the fingers or toes.

Fig. 57. Recurrent bandage.

To bandage the foot, take a circular turn around the ankle, carry the roll down over the top of the foot toward the toes, then under the foot near the base of the toes and back over the top of the foot, crossing the first turn in the middle line of the foot, directly above the toes; pass the roll upward and back of the ankle, then down again over and under the foot as before. Continue the turns until the foot is covered, making each one higher than the other and covering the preceding one about half

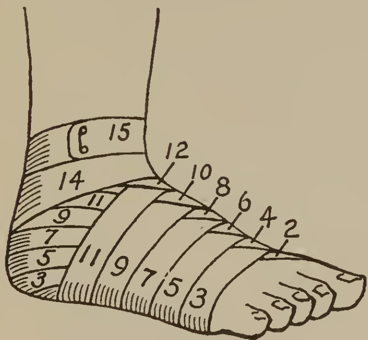

Fig. 58. Foot bandage.

its width. It will be seen that this bandage is on the principle of the figure-eight.

To bandage the heel, use a three-inch bandage, take a couple of turns around the heel (1) then carry the roll around the ankle, covering the upper part of the turns around the heel for at least one inch, pass obliquely over the top of the foot; (2) and then under the foot (just above the toes), up over the top of the foot, crossing the downward turn in the middle of the foot; (3) around the ankle (covering half of the former turn) back again over the top of the foot; (4) under the foot, and up around the foot; (5) take two turns around the ankle (6, 7). The figures refer to those in Fig. 59.

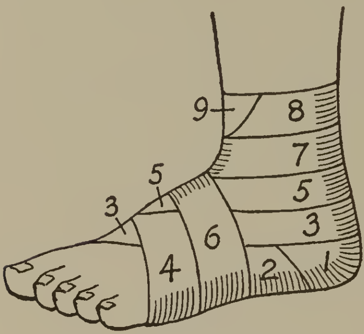

Fig. 59. Heel bandage

To bandage the leg, take two turns around the ankle and proceed up the leg with either reverse or figure-eight turns. It is well, especially if the patient is not confined to bed after making three or four turns (either reverse or figure-eight), to carry the bandage up and around the leg above the calf then down around the leg to above the regular turns and afterwards continue as at first. The turn around the calf helps to keep the band-

age from slipping. The knee is covered only when necessary, in which case proceed as for the elbow bandage.

To apply a spica to the shoulder, fix the free end of the bandage by taking a couple of circular turns around the middle of the arm of the injured side, make one or more reverse or figure-eight turns, then carry the bandage across (for the right shoulder) the chest or (for the left shoulder) the back, continue the turn around the body (passing under the armpit of the uninjured side) back to the injured side, pass the bandage obliquely around the arm on this side (forming the figure-eight) and then around the trunk as before. Continue to make these turns until the shoulder is covered. Overlap the turns on the arm one half their width but converge the bandage as it crosses the chest and back so that the fold under the armpit will be narrow.

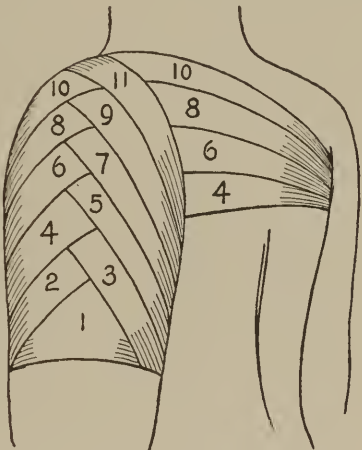

Fig. 60. Spica of the shoulder.

A spica for the thigh is put on in the same manner as the shoulder spica except that the turns around the trunk are carried upward to the waistline.

To bandage the arm take one or two circular turns around the wrist and then proceed up the arm with either figure-eight or reverse turns, do not cover the elbow unless necessary if the bandage is to be continued up the upper arm, when you reach the elbow, carry the bandage up on the inner side of the joint; take a circular turn around the arm above the joint and proceed as on the forearm.

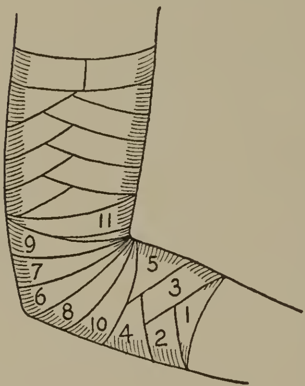

Fig. 61. Elbow bandage.

When the elbow is to be covered, discontinue the figure-eight or reverse turns about two inches below the joint, flex the forearm, carry the bandage upward and around the elbow, in a manner to have the point of the latter in the center of the bandage, bring the bandage downward inside the joint and around the arm (keeping the upper edge of the bandage just below the point of the elbow), pass upward crossing the previous turn on the inside of the joint, pass around the elbow (keeping the lower edge of the bandage just above the point of the joint), and then bring the bandage downward again. Repeat the turns, making that on the forearm lower and that on the upper arm higher than the preceding ones, then take a circular turn

around the upper arm and proceed with the figure-eight or reverse.

To bandage the hand without including the fingers, take a circular turn around the hand at the base of the fingers and, on reaching the back of the hand for the second time pass the bandage obliquely across it and around the front of the wrist, then down across the back of the hand, crossing the former turn in the middle of the hand, around the palm and up across the back of the hand again. Repeat the turns until the hand is covered, finish with a circular turn around the wrist.

Fig. 62. Hand bandage, fingers not included.

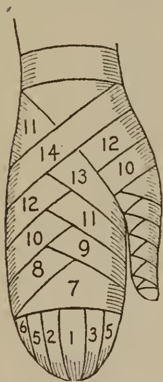

Fig. 63. Hand bandage. Fingers covered with recurrent bandage. Thumb covered separately and first with figure 8 or spiral reverse turns.

To bandage the hand when the fingers are to be covered put gauze or cotton between the fingers and over the tops and, it is well to put powder on the cotton; these, if there is a wound, should be sterile. Place the free end of the bandage about the middle of the palm of the hand, in the center take a turn over the fingers, and down to the middle of the back of the hand, then take recurrent turns, *back and forth*, across the tops of the

fingers, first on one side and then on the other of the first turn. Hold these turns in place with the thumb and first finger of the left hand until the fingers are covered, then secure them in place with a circular turn and bandage the hand as previously described. If the thumb is to be bandaged it is usually done before the hand.

To bandage the thumb or a finger. If the tip is to be covered, take two or three recurrent turns across the top and secure them in place with a circular turn, otherwise begin with the circular turn and proceed down the finger or thumb with either figure-eight turns or reverse. If more than one finger is bandaged and also the hand, it is customary to, after getting to the base of one finger, take a turn across the back of the hand, around the wrist, up the palm of the hand, then make a turn or two to carry the bandage to the top of the next finger that is to be bandaged and begin to bandage as on the first finger.

Slings, Handkerchief, and Tail Bandages

The sling illustrated in Fig. 64 and the handkerchief bandages can be made by folding a large handkerchief or a piece of muslin or other firm material (about three quarters to one yard square) diagonally, or the material can be cut diagonally. The result is a triangle as shown on Fig. 65. For the sling shown in Fig. 66, either a triangular piece of material with its central point folded in, or a

straight piece can be used. The tail bandages con-

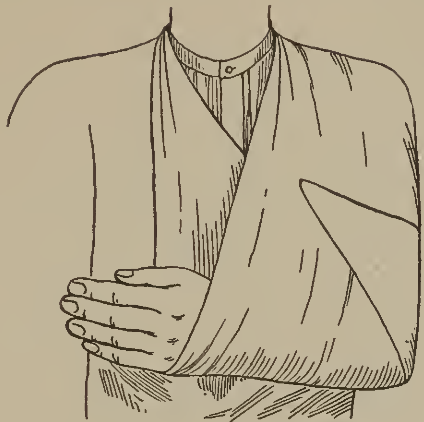

Fig. 64. Sling. The two points are tied at the back of the neck.

sist of muslin or similar material, long in propor-

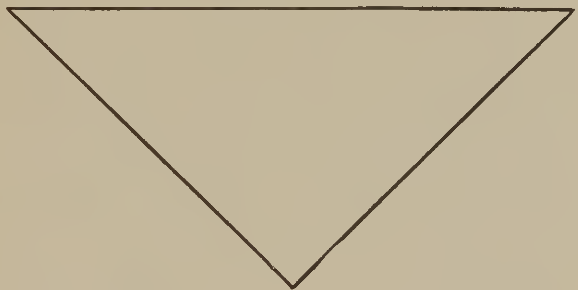

Fig. 65. Shape of material for sling shown in Fig. 64 and for the handkerchief bandages.

tion to their width (the size depending upon the part to be covered) split at each end. The meth-

ods of adjusting these slings and bandages can be easily learned by studying and copying the

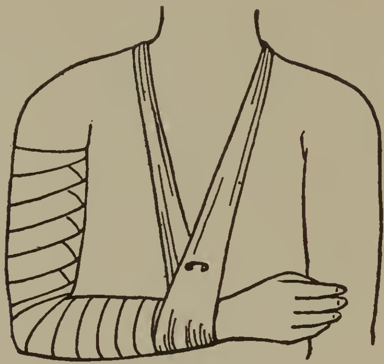

Fig. 66. Sling.

illustrations and, therefore, space will not be taken to describe them.

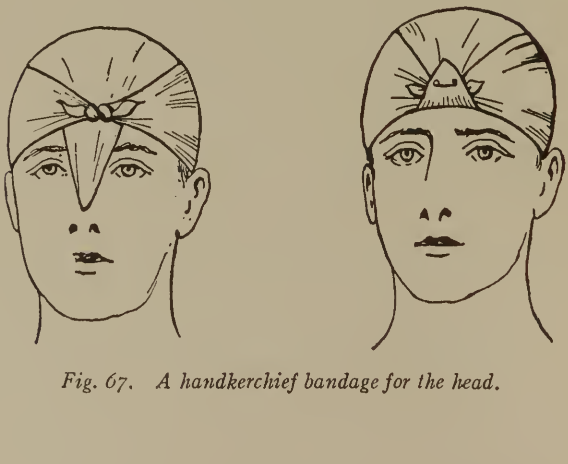

Fig. 67. A handkerchief bandage for the head.

Fig. 68. Handkerchief bandage for the hand.

Fig. 69. Handkerchief bandage for the heel.

Fig. 70. Handkerchief bandage for the foot.

Fig. 71. Four-tailed bandage of the head.

Fig. 72. Tail bandage on back of head.

Fig. 73. Tail bandage on forehead.

Fig. 74. Tail bandage for chin.

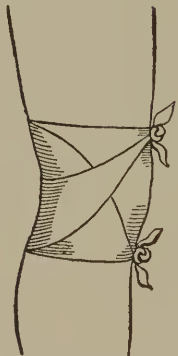

Fig. 75. Four-tail knee bandage.

PART II

CHAPTER XI

First Aid Treatment in Accident and Other Emergencies

The principles of first aid treatment. Nature, causes and first aid treatment of: Unconsciousness; fainting or syncope; hysteria; sunstroke; heat prostration; convulsions; chills. Demonstration 25: First aid treatment in the above emergencies, including lifting and carrying an unconscious patient who has fallen to the ground.

Equipment for demonstration: Hot-water bottles and some large glass bottles and corks to act as substitutes.

Covers for the bottles.

Ice-cap and cover and a basin of ice and compresses for the head as in Demonstration 21.

Bath towel and hand towels.

A foot-tub about three quarters full of water 105° F.

A bath thermometer.

A mouth thermometer

The baby doll model.

The principles of first aid treatment: In all serious emergencies the following points are to be remembered:

Do not get excited.

Send for a doctor at once and, if possible, let him know what has occurred, but do not waste time trying to get or give details.

Do not, unless absolutely necessary, attempt to give treatment that can be only carried out properly by a physician or surgeon.

Do not, without a physician's advice, unless absolutely necessary, give drugs other than the simple remedies mentioned in the following pages.

Do not molest doctors or nurses with your advice.

If there is nothing for you to do keep away and, if necessary, keep others away. A crowd around a person who has met with an accident may be very harmful for it is likely to excite and disturb her and to restrict her air supply.

When an accident occurs out of doors it is well to get the patient into a house as quickly as possible but, before moving her, ascertain if there are any signs of hemorrhage or fracture and if so take the means described later to prevent harm being done during the moving. If possible, when the patient is to be taken home, send someone ahead to notify the family and to give warning that the patient is not to be excited and that a bed should be prepared for her. Naturally, endeavor must be made not to alarm the family.

If the patient is frightened, reassure her and, if there is a severe wound or hemorrhage, take means to prevent her seeing the extent of the injury.

Keep the patient quiet and lying down with, unless there is apparently some injury to the head or her face is flushed, her head as low as possible; for reasons given later, when the conditions just mentioned exist, the head is to be slightly raised, though the patient is to be kept lying down.

Loosen the collar, tight bands, and corsets for, when the nervous system is depressed, even a very moderate constriction interferes with breathing and the circulation of the blood and after a serious accident there is always more or less depression of the nervous system.

Do not try to give an unconscious person liquid by mouth for, when unconscious, a person is not likely to be able to swallow and the fluid may get into her trachea and cause choking, but, if the person is able to drink, and there is no reason to suspect hemorrhage, give all the water possible and hot drinks such as tea and coffee.

If an unconscious person vomits, turn her head on one side so that the vomitus will run out of her mouth, otherwise, it may get into the trachea.

Unconsciousness

Unconsciousness, known also as *coma*, is a state in which an individual is insensible and cannot be aroused. It indicates depression[1] of the brain, especially that part known as the *cerebrum*. It results from many causes, some of the more com-

[1] Inability to function properly.

mon ones being: Shock, collapse, fainting, apoplexy, asphyxia, sunstroke, poisoning either by poisons generated within the body, as described under shock, or by drugs or alcoholic beverages.

When a person is discovered unconscious it is sometimes very difficult for even a physician to determine the cause and, therefore, it is likely to be quite impossible for anyone else to do so. Endeavor should be made, however, to ascertain if the condition is due to poisoning by drugs, sunstroke, hemorrhage, or asphyxia, because these conditions require immediate special attention. If this is not the case and the patient is not having convulsions and her breathing does not show signs of ceasing, until the doctor arrives, merely follow the instructions given above, and, if the pulse becomes weak and rapid, those given under Shock.

Shock and Collapse

Shock and a similar state known as collapse are conditions in which the nervous system is depressed and the blood is not circulating properly. As depression of the nervous system interferes with the circulation of the blood and inefficient circulation of blood in the brain and spinal cord will cause depression of the nervous system, it is not always known which of the two conditions is responsible for the other. In order to understand this and why shock is produced by the causes mentioned later it is necessary to recall the following facts: (1)

The action of the heart is regulated by impulses coming to it over nerve fibers extending from the brain. (2) The blood-vessels are maintained in a state of partial contraction or *tone* by nerve impulses coming from the brain and spinal cord and, if anything happens to depress (lessen the activity of) any part of the nervous mechanism concerned in maintaining this state of tone, the blood-vessels dilate and this not only interferes with the action of the heart but with the power of the blood-vessels to propel the blood onward through the body. This is the state of affairs existing in shock. (3) If the heart muscle and the muscle tissue in the walls of the blood-vessels are not in a healthy condition they will not respond properly to nerve impulses. (4) The action of the heart is also interfered with if the amount of blood in the vessels is reduced and this occurs when there is loss of blood from the vessels, or excessive loss of fluid from the body as the result of continued vomiting, diarrhea, or profuse perspiration, also, if the blood-vessels dilate, practically the same condition will be present because, as just stated, the blood will not pass onward through the veins.[1]

No one of the above conditions can occur to a marked extent without inducing the other nor involving all other parts of the body, because all

[1] The body can be likened to a furnace, with machinery attached. The machinery will only work while the fire in the furnace burns, and there will only be fire if coal or other fuel is provided and also air and, consequently, oxygen, for burning consists in the union of oxygen with matter.

the organs depend to some extent upon nerve impulses to make them work, and they also need the oxygen and fuel material brought to them by the blood to give them the energy which they need to carry on the work, and the nutrient material to repair the waste which the work entails. The nervous system, especially the brain, will be the first part of the body depressed if its nutrient, oxygen and fuel supplys are limited.

To say that an organ is depressed implies that its power to function (carry on its work) is reduced. The opposite of depression is stimulation. Anything which stimulates or excites an organ enables it to work more rapidly and strongly, but overstimulation ends in depression, because the organ becomes fatigued. For this reason fright, severe pain, intense anger will eventually induce a more or less intense state of shock. You have all, probably, at times experienced a sensation of faintness following pain or the emotions just mentioned, and this sensation is induced by a mild state of the conditions described in the preceding paragraphs.

The common causes of shock are: Hemorrhage or excessive loss of fluid from the body from such causes as those mentioned on page 261; exhaustion, as from starvation, exposure to cold, severe mental strain, or protracted illness (in the last-mentioned case the condition is spoken of as collapse); terror; intense pain; poisons, either those taken into the body or those formed within the body.

Poisons will be formed in the body by: (1) Bacteria, (2) interference with the chemical processes (known as metabolism) that are constantly taking place and upon which life depends; (3) failure of the body to get rid of waste matter, either food residue, which should be eliminated through the bowels; or the waste matter arising in the course of metabolism, which should be expelled chiefly through the kidneys and lungs; (4) substances produced by the chemical changes that occur in tissues when they are injured, especially when they are macerated or acted upon by corrosive drugs. The poisons may cause shock by depressing the nervous system, or by weakening the muscle of the heart or dilating the blood-vessels

The symptoms of severe shock are: The pulse is weak and usually rapid; the breathing shallow and feeble; the skin is pale, cold, and clammy; the face has an anxious expression; the pupils of the eyes are more or less dilated and the body temperature falls; when the shock follows an accident, the patient may be much excited for a time, but the excitement will be followed by a stupid condition and, very commonly, unconsciousness. The symptoms of shock usually develop slowly and may not be apparent for some time after an accident, particularly if the person is excited, but, it is to be remembered, a serious accident will always be followed by more or less shock, especially if it is associated with conditions that cause fear or involve much destruction of tissue.

The symptoms of slight shock are similar to those just mentioned, but less marked.

Three important things to be considered in the treatment of severe shock, and to prevent shock are: To keep the patient warm, quiet, and in a position to favor the flow of blood to the brain.

For the first requirement—**warmth**—wrap the patient in blankets or whatever suitable substitute can be obtained and, as soon as possible, surround her with hot-water bottles, glass bottles can be used in emergency. To avoid breakage while filling them, pour water over, as well as into them. It is to be remembered that, when the circulation in the skin is poor, as it always is in shock, a patient is very easily burned.

Quiet is essential to lessen the work of the heart; as previously stated, the action of the heart is greatly interfered with and any extra strain may be more than it can withstand. To insure quiet it is important to reassure the patient, for fear is likely to make her restless and also to make the heart beat more rapidly. Though all tight bands and clothing are to be loosened it is not, as a rule, advisable to undress a patient who is suffering from shock until her pulse improves, as this is likely to entail too much movement.

The required position is most easily obtained by laying the patient, without pillows under her head (except in the conditions mentioned on page 259), on a bed or couch and, if the symptoms of shock

become pronounced, raising the foot of the bed; this can be done by resting it on a table or putting stools or a pile of magazines, etc., under each of the legs of the foot of the bed. If the individual is out of doors and there is nothing at hand to facilitate getting her into the required position, any unevenness of the ground must be taken advantage of. Also when carrying the patient her head is to be kept low, therefore, the shortest carrier should support the upper part of the body.

If the patient's pulse becomes very weak before the doctor arrives, she can be given half a teaspoonful of aromatic spirits of ammonia or even ammonia water[1] in about two to three tablespoonsful of water, or the bottle of ammonia or smelling salts can be held so that the gas will pass into her nose and mouth. It can be given in the latter manner even when the patient is unconscious, but care must be taken in such case because the ammonia is very irritating to the membrane of the nose and mouth and to eyes. The ammonia must not be given by mouth when the shock is due to poisoning by irritant drugs. The value of the ammonia in helping to overcome shock is due to its irritant action which gives rise to nerve impulses that pass to the brain and cord and are transmitted thence to the heart and blood-vessels.

[1] Only half to one eighth this amount is to be given to a child, but, except in extreme emergency, ammonia should not be given a very young child.

Fainting or Syncope

Fainting is a condition of temporary unconsciousness brought about by interference with the flow of blood to the brain. It is in effect a mild stage of shock or collapse and is brought about by the same **causes.** Some people, however, faint very readily, the sight of blood, the slightest pain or nausea being sufficient to make them do so. Probably the two most common causes for this are ill health and suggestion. Examples of suggestion are: (1) Some people, especially those who have little self-control, having heard others say that they fainted on seeing blood expect to do likewise and, therefore, do; (2) a person who faints once, may fear that she is likely to do so again and, if she does not overcome the belief, is likely to do so if the occasion she fears arises; and, if a person faints frequently, especially in childhood, the habit is likely to be formed for, as previously stated, pathways are formed in the nervous system, by either the voluntary or involuntary repetition of acts, which increase the facility with which a person responds to any stimulus in the same manner as previously. Thus, it can be seen that, while fainting may be due to serious conditions, it may merely indicate a lack of self-control, or undue susceptibility to suggestion.

Symptoms: Before fainting a person is likely to experience sensations of nausea and faintness and to be conscious of roaring and ringing sounds in the

ears; her face becomes pale and covered with perspiration, her pulse grows relatively weak and rapid and she becomes unconscious; as a rule however the condition is of short duration.

Treatment: The essential feature of the treatment is to facilitate the flow of blood to the brain and, if a person, on first feeling faint, bends forward until her head is about on a level with her knees, loss of consciousness may be prevented. If this does not answer, lay her on her back, loosen her clothing and if she is indoors open a window. Sprinkling a little cold water on the face may be of help because the cold gives rise to nerve impulses which are transmitted, *via* the spinal cord and brain, to the heart and blood-vessels. Ammonia may be given by inhalation when the patient is conscious or by mouth in the doses mentioned on page 265. A drink of hot tea may make her feel better, because the heat is stimulant and tea contains caffeine which stimulates the nervous system. Coffee also contains caffeine, but some people when nauseated are not able to take coffee, because some of its other ingredients sometimes tend to increase this condition.

Hysteria

Hysteria is a term applied to various abnormal nervous manifestations. It is seen usually in persons who have not much will-power or self-control, though, occasionally, following severe

strain, either mental or physical, even a person of normal mental caliber may give way to emotion of an hysterical nature, such as uncontrollable laughing and crying. The other more **common phases of hysteria** are simulated fainting and convulsions, but the individual does not lose consciousness and, if she is left alone, she will usually promptly recover, while, on the other hand, attention and sympathy are likely to make her worse.

Treatment: Leave the person alone and see that others do likewise. In the case first mentioned a dose of aromatic spirits of ammonia (see page 265) may be given or a drink of hot tea or coffee.

Sunstroke

This condition is produced by exposure to the rays of the sun or to extreme heat from other sources, especially when the humidity is high. As stated in the Chapter on Ventilation, heat is eliminated from the body chiefly by radiation from the skin and by the evaporation of sweat and, if both processes are interfered with, as they are when the atmosphere is both hot and moist, the body temperature may rise exceedingly high. The author has seen patients with temperatures of 120° F. and possibly over, as this was as high as the thermometer registered.

The symptoms are: Unconsciousness, the face is red, the skin hot and dry, the pulse full and slow,

the breathing labored and sighing, the temperature rises gradually and, unless preventative measures are taken, may become exceedingly high and death is then likely to occur.

The usual treatment consists in putting the patient into a cold bath with an ice-cap or compresses that are kept very cold on the head, or if a bath cannot be obtained the patient is wrapped in a sheet that has been wet with cold water and is kept wet by sprinkling it with cold water. It must not be covered because it is only by the evaporation of the water that it will be sufficiently cold. A fold of the wet sheet or wet towel must be placed wherever two surfaces of the body come together, as between the legs and between the arms and chest. If the patient's temperature is very high the doctor is likely to order ice rubbed over the sheet, but, except in extreme cases and when there is delay in getting a doctor, an inexperienced person should not resort to such drastic measures; in fact, if a doctor can be obtained within a reasonable time it is better for any who is not likely to recognize symptoms of shock, to merely put cold on the head, bathe the neck and chest and get the bath or sheets, water and something to protect the bed, ready for use when the doctor comes. The temperature should be taken by rectum or axilla about every twenty minutes and the condition of the pulse ascertained every few minutes. The bath is discontinued when the temperature falls or if signs of shock become evident.

Heat Prostration

The term heat prostration is applied to a condition brought about, as in the case of sunstroke, by exposure to excessive heat, but the **symptoms** are somewhat different. They are: The patient becomes very faint, but not unconscious; the face is pale and the skin covered with perspiration; the pulse is weak and rapid, the breathing quick and shallow; the temperature is likely to rise considerably above normal but not as high as in sunstroke.

For treatment have the patient lie down in a cool place, put cold compresses or an ice-cap on the head; give the patient all the cold water that she can drink and, if they are at hand a dose (see page 265) of aromatic spirits of ammonia and inhalations of ammonia or smelling salts. If the patient does not recover promptly or the symptoms are at all severe a doctor should be notified.

Convulsions and Chills

Convulsions are commonly described as violent involuntary contraction of the skeletal muscles (those covering the skeleton or bony framework of the body), practically all these muscles may be involved or only those on one side of the body or only certain groups of muscles.

With the exception of those due to epilepsy or hysteria, **convulsions are almost always due to** excessive stimulation of the nervous system. They

occur more readily in childhood than in later life, for the nervous system is then more easily influenced and very trifling irritation, such as that due to the presence of worms in the intestine or indigestible food in the stomach or intestine, or intense emotion as anger or fear may excite the nervous system sufficiently to induce a convulsion. Common sources of nerve-excitement and consequent convulsions, in both adults and children are: (1) Pressure on some part of the brain or spinal cord, as when there is a fracture of the skull or spinal column, or when there is hemorrhage into the brain and a clot forms, as may occur from an accident or in the condition known as *apoplexy;* (2) many poisons, both those ingested and those formed within the body as described on page 263; (3) anything that prevents the body getting sufficient oxygen.

It may be difficult for even a doctor to determine the cause of convulsions, but nevertheless it is important for anyone seeing a person in convulsions to try and ascertain it for the first-aid treatment required depends upon the cause. The first points to be considered are: Is there any evidence that poison has been taken; is it known if the patient has kidney disease (in which case the convulsions are probably due to a condition known as *uremia);* is there any history of previous convulsions, this would suggest hysteria or epilepsy; has the patient been subjected to unusual strain, either mental or physical, this in an elderly person, and

associated with the symptoms described later would suggest apoplexy. If the patient is a child, further questions to be asked are: What it has eaten, if it has shown any evidence of having worms or been exposed to an infectious disease recently.

Also, there are certain **differences in the symptoms produced by some of the causes of convulsions,** that may aid in determining the cause, for examples:

In hysteria the patient is not unconscious and takes care not to hurt herself.

Before a **convulsion due to epilepsy** the patient generally gives a sharp cry and falls unconscious. The muscles are at first stiff and rigid, but are soon thrown into violent contractions, the muscles of the jaws are involved so that there is danger of the patient biting her tongue and the excessive movement stimulates the secretion of saliva to such an extent that there is foaming at the mouth.

When the convulsions are due to the conditions existing in uremia (in which the kidneys are not eliminating the waste products of metabolism), there is usually an odor of urine to the breath, the face is likely to be flushed, the breathing is of a snoring character, the pulse is full and strong.

The symptoms of apoplexy[1] are very similar to those of uremia except that (1) there is no odor of urine to the breath; (2) the pupils of the eyes are usually dilated and of unequal size and (3) there is usually paralysis of the part of the body that re-

[1] Apoplexy is due to the rupture of blood-vessels in the brain.

ceives nerve impulses from the portion of brain upon which the clotted blood is pressing.

Convulsions due to injury of the brain as the result of fracture of the skull are generally associated with symptoms similar to those of apoplexy, except that the face is likely to be pale and there may be hemorrhage from the ears, eyes, nose, and mouth, and signs of injury to the skull.

Convulsions due to ingested poisons are associated with other symptoms induced by the poisons as described under Poisoning.

It is very important to notice if all parts of the body are convulsed, and if not, which parts are, for this knowledge often helps the physician determine the cause of a convulsion, and the convulsion may cease before he arrives.

Treatment: For convulsions due to the **hysteria,** as previously stated, leave the patient alone, but watch to see that she does not injure herself, though she is not likely to do so. When the convulsions are known to be **epileptic** it is usually better to leave the patient on the ground and the only treatment required is: (1) To put something soft, as the edge of a folded towel between the teeth at one corner of the mouth, so as to keep the jaws apart to prevent the tongue being bitten; and (2) to loosen tight bands. Do not try to restrain the patient's movements, for, by so doing, you may injure her, but see that she does not strike against anything. If it is not positively known that the convulsion is epileptic, or if it lasts much

longer than preceding ones, or there are unusual symptoms, notify the doctor. For convulsions due to other causes, send for the doctor immediately; take the means just described to prevent the patient biting her tongue; loosen tight clothing, remove the cause of the convulsion, if possible; keep the patient lying down with her head slightly elevated; put cold compresses or an ice-cap on the head and watch that she does not injure herself by knocking against anything. **If the patient is a child** put her into a bath with a temperature about 105° F.,[1] keep the cold application on her head. After about fifteen or twenty minutes, remove the child from the bath and place her between soft blankets; do not use too many covers for the child must not be too warm, but avoid any danger of chilling. Keep the room fairly dark and the child as quiet as possible. If the convulsion was due to anything that the child has eaten the doctor usually prescribes a dose of castor oil and an enema, and only allows water, or possibly whey, to be given by mouth for at least twenty-four hours.

Chills, like convulsions, **consist of** involuntary contractions of voluntary muscles, but the con-

[1] As a thermometer can seldom be obtained in emergency it is well for the pupils to test water of this temperature with their arms for it is important that the water used for a bath to arrest convulsions should be about this temperature, for, if it is much below 105°, it is not likely to have much effect and, if it is much hotter, it will interfere with heat elimination and as, during convulsions, there is excessive heat formation in the body, it is most important not to hinder its loss.

tractions are less intensive and the condition is not necessarily associated with loss of consciousness. **Chills are** due to the same causes as convulsions and to exposure to cold. They occur most frequently in adult life because a degree of nerve excitement that induces a chill in an adult is likely to create a convulsion in a child and, the younger the child, the more likely is this to be the case.

The symptoms vary somewhat with the intensity of the chill: there may be merely chilly sensations and slight shivering or the teeth may chatter and the shivering become so intense that the movements are almost convulsive and, in such case, the lips will become blue and the skin pale because the blood-vessels near the surface of the body will be contracted and the blood thus forced to the interior of the body. Following such a chill there is likely to be a considerable rise of temperature, especially if it occurs in the course of an infectious disease, because muscular contractions increase the oxidative processes which are the chief source of heat in the body and, also, whatever causes the chill is likely to affect the temperature, especially if bacteria are the active agent.

Treatment: If the chill is at all severe, get the patient to bed as quickly as possible, wrap her in blankets and put hot-water bags around her. Remove the blankets and hot-water bags as soon as she stops shivering and if, as is likely to be the

case, she has a headache, put cold compresses or an ice-cap on her head. Take her temperature and if it is more than a degree or two above normal notify a doctor, because a chill is one of the first symptoms at the onset of a number of serious diseases, such as pneumonia, influenza, scarlet fever, and measles.

The usual treatment for slight chilling, especially following exposure to cold, is to take a hot bath and hot drinks, especially hot lemonade, and a dose of aspirin (five or ten grains for an adult, two or five for a child between twelve and sixteen (children younger than twelve years should not be given such drugs without a doctor's order) and go to bed. Care must be taken to keep warm after this treatment because the aspirin, hot bath, and drink will cause free perspiration, and exposure to cold or a draft may hasten the evaporation of sweat to such a degree that the body will be chilled and the condition which the treatment is used to cure made worse. This condition consists of congestion of the membrane of the air passages and, possibly, of other internal organs. Congestion in the air passages (throat, nose, bronchial tubes, lungs) favors the activity of the various species of bacteria that cause colds and the treatment, by increasing perspiration (and thus taking fluid from the blood) and increasing the amount of blood in the skin, lessens the internal congestion and is therefore likely to abort the cold.

Demonstration 25

Lifting an Unconscious Patient from the Floor and the Treatment for Fainting, Shock, Chills, and Convulsions

Procedures similar to those for this demonstration have been described in previous lessons and, therefore, with the exception of lifting a patient from the ground, the pupils should be able to carry out the instructions given in the preceding pages without further explanation. The doll can be used for the treatment of a child with convulsions but some of the pupils should act as subjects for the other procedures, one pretending to faint, another to be in shock, another to be having a chill, and another a convulsion; those pretending to be in shock and to be having a convulsion should lie on the floor that they may be lifted and carried to bed. Other pupils should demonstrate the treatment and should act as though the emergencies were real, putting into effect the instruction given under principles of first-aid treatment, as well as that for the special emergency, and also the instruction given in Chapter II regarding lifting and carrying patients.

To lift a patient from the ground: Two pupils crouch by the patient, on the same side, your feet planted firmly on the floor, your knees bent sufficiently to make you low enough to pass your arms readily under the patient. If the latter is supposed

to have convulsions or to be suffering from injury to the brain, let the taller of the two lifters be the one to support the head, but, for the patient in shock let the shorter of the two take the head. As usual, one lifter is to give directions. Be sure that your skirts will not be in your way when you rise. Let the lifter at the head pass one of her arms under the patient's shoulders to the further armpit, and the other under the small of the back, while the other lifter passes one of her arms under the patient's hips and the other under her knees. At word from the director, lift the patient unto your knees. Readjust your hold, make sure that there is nothing in your way and, following the directions given in Chapter II, carry the patient to the bed.

CHAPTER XII

Asphyxia or Suffocation. Artificial Respiration

Mechanism of breathing. Nature, common causes and treatment of asphyxia. Demonstration 26. Artificial respiration and treatment of an individual rescued from drowning.

Equipment for demonstration: (1) A lungmotor if possible.

(2) Blankets or old coats or other substitutes to put under the chest as in Fig. 76.

Review of the mechanism of breathing: In the portion of the brain known as the *medulla oblongata* there is a small area called the *respiratory center* from which impulses pass over nerve fibers to the muscle tissue in the diaphragm and to the muscles which move the chest wall. These impulses are the result of the stimulation of the center by the carbon dioxid carried through it by the blood. The carbon dioxid is formed in the tissues by the oxidation of substances derived from food that has been eaten, digested, absorbed, and carried to the tissues by the blood. The impulses discharged into the muscle tissue make it contract, and this results in the diaphragm being pulled down and the ribs being pulled outward and up-

ward so that the chest cavity becomes considerably enlarged. The elastic lung tissue expands in keeping with the chest walls and this causes a partial vacuum in its little air sacs and in the passages leading to them (the bronchial tubes and bronchioles)[1] and then the pressure of the air around the body is much greater than in the air sacs and passages and therefore, air is forced into the air tubes and sacs. The expansion of the chest is immediately followed by its contraction and some of the air is then pressed out. The air forced into the air sacs during inspiration (the period in which the chest expands), contains more oxygen and less carbon dioxid than there is in the blood and thus, as gases always tend to spread out through space and are able to pass through the very thin walls of the air sacs and the small blood-vessels in the lungs, oxygen passes into the blood and the carbon dioxid brought from the tissues leaves the blood and is exhaled during expiration (the period in which the chest contracts). The oxygen inhaled unites with a substance, known as *hemoglobin*, that is contained in the red corpuscles of the blood,[2] but the combination is not very stable and as the blood

[1] If the pupils have not studied physiology, they should, if possible, be shown the lungs of sheep or calves and allowed to blow them up and dissect them.

[2] The combination of hemoglobin and oxygen is known as oxyhemoglobin. This is of a red color and, therefore, the blood in the arteries is red but that in the veins has a bluish tinge, the color of the hemoglobin when not combined with oxygen, because much of the oxygen has left the blood before it reaches the veins.

passes through the tissues where there is no free oxygen that in the red cells passes out of the blood-vessels into the tissues and is used for the oxidative processes necessary to supply the body with heat and energy. The compounds with which oxygen unites are decomposed and one of the waste products of the decomposition is the carbon dioxid which passes through the capillaries and lymph vessels and is thus taken to the veins and is finally eliminated, as previously stated, through the lungs.

Asphyxia or suffocation is a condition induced by an insufficient supply of oxygen in the body. The insufficiency may be due to many causes, some of the more common ones being: (1) An insufficient supply of oxygen in the air, as at high altitudes and in improperly ventilated mines. (2) Obstruction to the entrance of air to the lungs as by (a) swelling of the throat or other air passages such as occurs in many diseases, but particularly diphtheria, and as the result of injury to the tissues by irritating gases or corrosive liquids; (b) the entrance of foreign substances into the air passages or (c) external pressure upon the trachea (wind-pipe). (3) Inflammation of the lungs. (4) Interference with the circulation of blood through the lungs. (5) Water in the lungs—as occurs in drowning. (6) The inhalation of certain gases, especially carbon monoxid (one of the constituents of illuminating gases), which unite with the hemoglobin of the blood and thus prevent it absorbing oxygen. (7) The destruction of the red cells of

the blood by poisons. It is by this means that the venom of certain snakes causes death. (8) Depression of the part of the nervous system which moves the muscles responsible for breathing.

The symptoms of asphyxia vary somewhat according to the degree of suffocation and its cause, but there will be discoloration of the skin, especially that of the face, it may be of a bluish tinge or, in extreme cases, a deep reddish purple; the breathing is likely to be labored and gasping but when the asphyxia is due to depression of the nervous system, the breathing may become very slow and weak and cease suddenly and, when the condition is associated with drowning, or hanging, or collapse it may be almost impossible to tell if the individual is breathing; if the asphyxia is profound there will be loss of consciousness and probably convulsions.

The treatment consists in removing the cause if possible, placing the patient where she will get fresh air, but keeping her warm; giving artificial respiration if necessary. Needless to say a doctor must be sent for at once and, if possible, a lungmotor. Such appliances are usually obtained from hospitals, stores where surgical supplies are sold, and the emergency stations at bathing beaches.

Artificial Respiration

Artificial respiration consists in making the chest wall alternately contract and expand in as

nearly the same manner as in natural breathing as possible. The easiest method of giving artificial respiration when a lungmotor cannot be obtained is that known as the *Schaefer method.*

To carry out the Schaefer method proceed as follows: Lay the patient prone on the ground with a pillow or substitute under the lower part of the

Pressure on expiration

Pressure off inspiration

Fig. 76. Schaefer method of artificial respiration.

chest, her head turned on one side and her arms stretched above it. Kneel across the patient's

thighs, facing her head; place your hands flat over the lower part of her back, covering the lower ribs with your fingers pointing toward the sides; lean forward forcibly, throwing the weight of your body upon your hands, thus making all possible pressure upon the patient's back; do this gradually and slowly (this movement which is a substitute for expiration will force air and, if it is present, water from the lungs); then, as gradually, relax your pressure by slowly straightening your back, but keep your hands in position. Repeat these movements of alternate pressure and relaxation at a rate that will allow of about sixteen (the two movements being counted as one) being made per minute.

Important points to remember in connection with artificial respiration are: (1) The movements are not to be quicker than those of ordinary breathing. (2) Unless it is positively known that the individual is dead, artificial respiration should be maintained for about an hour because, though recovery is hardly likely if breathing has ceased for more than five minutes, it has occurred when the person has been under water a much longer time and apparently has not begun to breathe for a very considerable time after artificial respiration has been commenced. (3) Even after natural breathing has started, it may cease suddenly and, therefore, the patient should not be left alone for an hour or more. (4) Pneumonia is a very common sequela of conditions necessitating artificial

respiration, and anything (*e.g.*, damp clothing) that will also favor the development of this disease should be removed as quickly as possible. If after a person has been rescued from drowning it is impossible to undress her at once, something dry should be put over her to retard evaporation and consequent chilling of the body and, as soon as help can be obtained, even while artificial respiration is being given, she should be undressed and rolled in dry blankets or substitutes and treated for shock.

Demonstration 26

Treatment of a Person Rescued from Drowning Artificial Respiration

Procedure: Let some of the pupils be subjects and the others give the treatment, they should act as though the emergency were real.

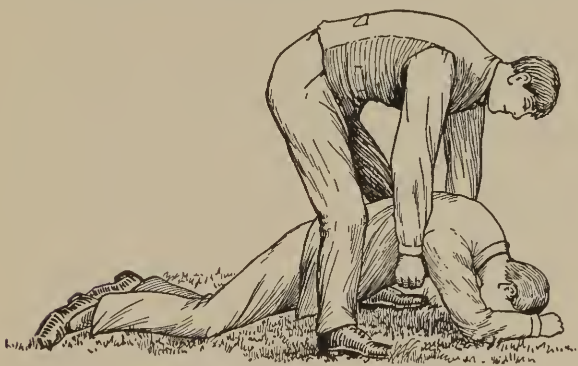

Fig. 77. Emptying water from the lungs.

Let each one, as quickly as possible (1) see if there is any seaweed in her patient's mouth, and pretend to (2) loosen tight bands. (3) Turn the patient prone on the ground, pass the hands under her abdomen and raise her as in Fig. 77, to further the flow of water from the lungs.

(4) Place the patient prone on the ground with her head turned on one side; throw something dry over her, your own coat if necessary, and proceed with artificial respiration as previously described.

CHAPTER XIII

Wounds

The nature, classification, means of repair, and common complications of wounds. Causes of, and means of preventing, the infection of wounds. First aid treatment of wounds. Demonstration 27: Dressing a wound.

Equipment for demonstration: The first aid box.

Boiling water.

Clean towels.

Toilet basin and water, hot and cold, for the hands.

Paper bag or other receptacle for soiled pledgets, etc.

Nature and Classification of Wounds

A wound is usually defined as *a break in the continuity of body tissue caused by violence or intentional cutting.*

According to their nature wounds are classified as:

1. Incised wounds, *i.e.*, those in which the edges are clean cut and there is no tearing of the tissues. Such wounds are made with a sharp instrument as a knife.

2. Contused wounds, *i.e.*, those associated with contusion[1] or bruising of the tissues. The edges of such wounds are usually crushed and jagged. A wound of this kind is generally made by a blow from a heavy object or a fall.

3. Lacerated wounds; in these the edges are torn and mangled. These are the kind of wounds likely to be produced in accidents caused by machinery.

4. Punctured wounds; in these the wound is deep in proportion to its diameter and it has but a small opening. Such wounds are produced by pointed objects as nails, daggers, etc., and, sometimes, by bullets.

Wounds are also classified according to their origin (e.g., *operative wounds*, *gunshot wounds*, etc.) and depending upon their freedom from, or contamination with, bacteria, as *asceptic and infected wounds*.

Aseptic wounds are defined as *wounds which are sufficiently free from microörganisms to show no symptoms of infection*, and **infected wounds,** as *wounds which are invaded by organisms sufficient in number and virulence to produce pathological symptoms*.

Allied to wounds, though not usually thus classified, are the open sores such as ulcers, pressure sores, and those caused by some forms of eczema and other skin diseases.

[1] A contusion is a wound, associated with rupture of blood-vessels, beneath the skin. The discoloration is due so the extravasation of blood into the tissues.

Healing of Wounds

Four processes by which the body endeavors to repair wounds in its tissues are: Fighting infection; the disintegration and removal of débris, such as blood-clots and destroyed tissue cells; the proliferation of new cells; and, when possible, the sealing together of the walls of the wound.

Conditions favorable for these processes are promoted by the injury; three of which are: (1) Blood escapes from the severed vessels and this helps to wash out foreign substances, including bacteria, that have entered the wound. (2) The blood-vessels in the part become dilated and this interferes with the passage of blood, consequently an unusual amount of blood-plasm passes through the walls of the capillaries and, with it, white blood-cells known as *phagocytes*[1] which can either disintegrate or demolish small blood-clots, dead tissue cells, and bacteria remaining in the wound. This plasm or lymph also supplies the extra food material[2] necessary for the growth of the new cells required to replace those destroyed and, as the plasm is of a glutinous nature, it helps to hold the walls of the wound together if they are brought into apposition. (3) The third important effect of the

[1] From the Greek *phagein* = to eat and *kytos* = a hollow vessel.

[2] If the congestion becomes so severe that the flow of fresh blood through the wound is interfered with, the food supply for the cells is limited, therefore the prevention of all unnecessary irritation and interference with the circulation, as by tight bandages, is one of the very essential considerations in the care of wounds.

injury is the stimulation of the reproductive faculty of the cells.

Reproduction of cells: All the tissues of the body are composed of cells and what is known as *intracellular substance*, which is secreted by the cells. In the beginning of life the body grows because the cells absorb nutriment from the lymph[1] increase in size and then divide, thus forming new cells. The cells of some tissues, especially those of the skin, blood, blood-vessels and fibrous tissue,[2] retain this power of reproduction all through life, but others, especially those of muscle and nerve tissue, lose it to a great extent, even before body development ceases, and then their growth depends upon increase in the size of the cells and the deposition of intracellular substance. Therefore, when a wound is made in muscle tissue, except in very early youth, the destroyed muscle cells are not replaced, but new cells arise from the fibrous[3] tissue that is present in the walls of the wound,

[1] The material which exudes from the blood-vessels into the tissues.

[2] Fibrous tissue, in the form of bands (ligaments) and cords (tendons) holds the bones together at their joints and the muscles to the bones and, in the form of thin sheets, it exists to some extent in almost all the soft tissues of the body, either affording a foundation for their cells or holding the substance of the tissue together and different tissues to each other. If the skin or fat is raised from a piece of meat and the flesh of the meat pulled apart this fibrous tissue will be seen as thin white strands.

[3] A form of fibrous tissue, known as areolar tissue holds the muscle cells together. Also it holds different tissues together and thus it exists in all parts of the body.

and from the cells of the skin around the edges of the wound, and from the cells of the injured blood-vessels. The new cells arising from the blood-vessels form small loops of capillaries that extend into the wound and thus the new fibrous tissue and skin are supplied with blood. In an open wound the new capillaries and cells give the walls of the wound a rough granular appearance and they are therefore called *granulations*.

During the first stages of healing the new fibrous tissue cells are relatively large and soft, but they gradually contract and harden, and thereby press upon the newly formed blood-vessels and cause their obliteration. These effects result in the new tissue becoming hard and inelastic and gradually losing the red color that is characteristic of new tissue while it is plentifully supplied with blood. Eventually the part becomes whiter than the surrounding skin. The mark thus left is known as the *scar* or *cicatrix*.

The amount and degree of hardness of scar tissue that will form following a wound depends upon several factors; important ones are:

1. The nature of the wound: Naturally a small, aseptic, incised wound will heal more rapidly than a large wound, or one in which tissue has been destroyed by the processes associated with infection, or one in which the edges are torn or contused.

2. How soon the walls of the wound are brought together: Immediately following injury the conditions are more favorable for agglutination than

later, and the more firmly the walls adhere, the less the amount of new tissue required.

3. The age of the individual: In youth, while tissue growth is still in progress, a wound, other conditions being equal, will heal more rapidly than in adult life, and there is always a chance of the reproduction of some muscle cells and of the fibrous tissue remaining relatively pliable. In old age, on the contrary, scar tissue is likely to become very dense and inelastic.

4. The vitality of the part: If the person's health is poor at the time the wound is received or if anything interferes with the circulation of blood to the wounded part, healing is likely to be delayed.

The more common causes of interference with the circulation are a tight bandage and excessive congestion in the wound. **Excessive congestion** is likely to occur if the wounded part is not kept at rest or if its position favors the flow of blood into and not from the part, for example, if the wound is in the hand and this is allowed to hang downward.

A large scar is unsightly and, furthermore, if it extends deeply into the tissues, it may, by its contraction, cause a deformity that will seriously interfere with the movement of the part, this is especially likely to be the case if the wound is near a joint.

Another factor of importance in the results of wounds is the presence or absence of injury to other tissue than muscle, *e.g.*, tendons or nerves. If

either a tendon or nerve is cut the severed ends should be sewn together by a doctor *at once* for, if much time is allowed to elapse, the ends will retract and then some part below the injury may be useless for ever more.

Thus, the chief points to be considered in the first aid treatment of wounds are: (1) The prevention of infection, this is important with the smallest of wounds, even a pin prick. (2) If the wound is at all deep[1] it is to be inspected by a doctor, this is especially important if it has been made by a dirty object, or one that has been near a stable or manured soil,[2] or if a tendon or nerve seems to involve in the injury—this is particularly likely to be the case in deep wounds of the wrist, hand or fingers. (3) If the sides of the wound gape, or a part (*e.g.*, the tip of a finger) is cut away, means should be taken to keep the raw flesh together and, especially in the latter case, a doctor should be seen immediately so that the parts can be sutured; if this is done soon after the injury occurs and

[1] Deep wounds are always more likely to be infected than superficial ones because: (1) They are harder to clean; (2) some of the most virulent microörganisms that infect wounds thrive better when they are out of contact with air.

[2] The germ that causes tetanus (lockjaw) is a normal habitat of the intestines of some animals, especially horses, and thus wounds acquired under the conditions mentioned above are particularly dangerous. Wounds made with fire-crackers and toy pistols have frequently resulted in tetanus, because of the soil on the hands when the wounds were made and, in the accident, the soil and germs are driven deeply into the flesh, away from the air, which is favorable for the *tetanus bacilli.*

there is no infection the severed parts are likely to grow together readily. The treatment of hemorrhage and other common complications of wounds will be found in Chapter XIV.

Important means of preventing infection are: (1) To let the wound bleed freely.[1] If it does not do so the part should be held in a position to encourage bleeding[2] and pressure made from above downward, toward the wound; this is particularly necessary after pricks such as are made with pins or needles, because in such cases it is generally the only preventative measure taken, and exceedingly bad infections have been contracted by pricks from pins and needles infected with bacteria. (2) A little tincture of iodine diluted to half the usual strength[3] (which is 7 per cent.) painted over the wound and surrounding skin is an excellent means of inhibiting infection for, unlike most disinfectants, it penetrates the skin. It will make the wound sting for a few minutes but this disagreeable sensation soon passes. As moisture on the skin interferes with absorption, the iodine should be applied before the skin is washed, if washing is necessary. (3) If the skin around the wound is dirty it should be washed with boiled water and,

[1] Of course caution must be observed if the blood is coming in spurts, as this would indicate arterial hemorrhage. or if the bleeding is excessive.

[2] Holding the bleeding part lower than the heart encourages bleeding and raising it above the heart is an important step in checking bleeding

[3] See footnote page 3.

if possible, green soap before a permanent dressing is applied. (4) Everything that is to come in contact with the wound itself or with anything that will touch such articles must be made sterile and kept sterile.[1]

Infected wounds: Nothing will be said here regarding the treatment of infected wounds, for this is too important to be left to home care, but some knowledge of the processes that occur in infection will, I am sure, be found interesting.

Infection of wounds implies, as previously stated, the entrance of bacteria into a wound in sufficient numbers to produce abnormal conditions. Only certain species of bacteria, chiefly those classed as pyogenic (pus-producing) have any effect in wounds, but some species which enter the body through wounds, will have very serious systemic effects; of this class are the organisms causing tetanus (lockjaw) and hydrophobia.[2] It is usually with the pyogenic types of bacteria that wounds become infected. There are several varieties of these bacteria, some of which are much more virulent than others, but they all induce the following con-

[1] It is to be understood that this description is merely for a superficial wound in which there is no foreign matter. If any of the conditions mentioned as needing a doctor's inspection exist, a sterile dressing (see page 301) should be applied and the doctor seen at once. If iodine can be obtained without loss of time, it is well to paint the skin around the wound before putting on the dressing.

[2] The organism causing hydrophobia is injected into the body by the bite of an animal usually a dog that has the disease.

ditions, the more toxic species doing so more rapidly and intensely than others. As the result of their life and growth, they induce local irritation and consequently cause the dilation of the blood-vessels in the part. This results in the collection of an unusual amount of blood and the exudation of an extra amount of fluid from the vessels into the tissues. Thus the part becomes red, hot, swollen, and painful. A mild stage of this condition is known as *congestion* and an intense stage as *inflammation*, and the **symptoms of inflammation** are said to be redness, heat, swelling, pain, and imperfect functioning. Under such conditions large numbers of the white corpuscles of the blood, known as *phagocytes*, force their way through the walls of the vessels and proceed to demolish the bacteria and, if they succeed, normal conditions in the part are restored. This is known as *resolution*. On the other hand, if the phagocytes cannot destroy the bacteria they themselves are destroyed in large numbers, and also cells in the tissue of the wound and then what is known as *pus* is formed. The process of the formation of pus is termed *suppuration*. **Pus consists of:** Disintegrated tissue, the material which exudes from the blood-vessels as the result of their congestion, living and dead bacteria and their toxins, the phagocytes that have been destroyed by the bacteria.

When suppuration occurs an incision must be made in the tissue (by a surgeon) to allow the pus to escape, otherwise the toxins, and even the bac-

teria, may be absorbed and a very serious condition known as *septicemia* (blood-poisoning) result. Also the tissue may become so disintegrated by the suppurative process that pus-filled cavities, known as *abscesses*, will form.

The presence of bacterial toxins in the body, both before and after suppuration, stimulates the formation of new phagocytes. If a person is in a healthy condition the new cells develop more rapidly then otherwise, therefore, in the **treatment of infections** everything must be done to maintain the patient's health. Another important item in the treatment is to keep the infected part quiet, for the movement of the muscles in the area hastens the absorption of septic material and furthers its spread through the surrounding tissues.

Though not connected with the care of wounds, a few words will be said here regarding what are sometimes called *focal infections:* Especially in certain parts of the body, such as the sockets or *alveoli* of the teeth, and the cavities in the bones of the forehead, and cheeks and those behind the nose, and the tonsils when they are not normal, bacteria may enter and live for long periods and their presence, at least in the bone cavities, may not be recognized because, as there are few nerves in these parts, pain will not be induced and, as there are few blood-vessels, the absorption of toxic matter goes on so slowly that the progress of the conditions it produces may be very insidious, but many diseases of the joints (usually, though often

erroneously, called rheumatism), and infections of the heart, and other diseases have been traced to this source. Infections in the tonsils are more easily discovered because tonsillitis generally occurs.

Demonstration 27

Dressing a Simple Wound

Important precautions to remember when dressing a wound: (1) Watch that nothing unsterile gets near the wound or near anything that will come in contact with the wound. (2) When you are not using the scissors and forceps keep them in the dish in which you sterilize them. (3) Handle the gauze and cotton with the scissors and forceps, never with your fingers, for it is impossible to make these sterile. (4) Either wipe the rim of a bottle before pouring out a liquid or, if the latter is not expensive, discard the first portion that flows over the rim. (5) Remember the instructions, given later, regarding the direction in which the skin is to be rubbed when washing around a wound. (6) If sterile gauze and cotton are not at hand substitute clean, soft, white muslin, and make it sterile by ironing it or if there is no iron, boiling it. Prepare one piece to act as a protector for those to be used for the wound.

Procedure: Let one of the pupils pretend to be the wounded person and sit near the table on which

the supplies are to be placed, and let another proceed as follows: cover the point of the orange stick with soap and rub it under your nails; scrub your hands thoroughly with soap and hot water, soak them in the hot water,[1] rinse them in cold water.[2]

In the instrument dish, boil enough water to keep the instruments covered while they are being sterilized; add about a quarter teaspoon of washing soda for each cupful of water[3]; put a small wad of clean muslin[4] into the dish; open the scissors and put them and the forceps with their points on the muslin pad. Let them boil for three minutes, not more, because boiling blunts the scissors.

If the skin around the wound is dirty and, for class, it had better be pretended that it is, also boil the small bowl, a piece of clean muslin, a nail brush, and some water.

While the instruments are being sterilized, spread a clean towel over the table with the surface that was folded inside uppermost. Remove the outer covers from the cotton and gauze, loosen but do not remove, their inner wrappers, place them on the towel. Also, get out the adhesive

[1] This is to increase the activity of the sweat glands in the skin so that the perspiration will wash out bacteria from the ducts leading from the glands to the skin.

[2] This is to check secretion and contract the muscle in the skin so that any remaining bacteria will not be washed to the surface for the time being.

[3] This helps to disinfect the instruments and also prevents them from rusting.

[4] This is to protect the points which are easily blunted.

plaster, a bandage, ointment, if it will be required (*i.e.*, if there is so much abrasion of the skin that the dressing would be likely to stick to the wound) iodine and, if the skin is dirty, either green soap,[1] lysol, or alcohol.

As soon as the instruments are sterile pour the water from the dish, holding the latter so that their blunt ends (and not the points) will touch the sides of the dish if they move while you are doing so.

Insert the points of the forceps under the cover on the cotton (do not let them touch the outside), open it enough to allow you to cut off a small swab (about half inch square). Dip this in the iodine (remove and replace the cork in the bottle as described on page 145); pass the swab over the wound and surrounding area.

If the skin is very dirty, take the small basin from the boiling water (you can use the forceps for doing so), fill it with water and enough green soap[2] to make a lather, or else put some alcohol into the bowl. For the treatment of a real wound about fifteen minutes must be allowed to elapse before the skin is washed and the water can be cooling sufficiently in the meantime, however, it should be used as hot as possible. If practicable, soak the part in the lather, if not soak some boiled muslin or sterile gauze in the lather and cover the

[1] Other soap can be substituted, but this is better for surgical purposes.

[2] Other soaps can be substituted, but these are better for surgical purposes for they are likely to be purer and they, especially the lysol, are excellent disinfectants.

part with this. When the skin and dirt are thus softened take the forceps and scissors and, as previously directed, cut a swab of cotton or gauze about two inches square and wash the skin surrounding the wound; when doing so, rub in the direction of the axis of the wound, do not rub away from the wound, because this draws the edges apart, and do not rub toward it, because this may wash foreign matter into it. If necessary, the skin at a distance from the wound can be scrubbed with the nail brush or boiled muslin. Pour the clear boiled water over the part and then dry it by gently patting it with a fresh swab of cotton or of sterile gauze.

The dressing, unless there is much abrasion of the skin, usually consists solely of gauze. Cut a piece the size required and, touching it only with the forceps and scissors, open out the folds and then place it in a loose mass over the wound.[1] Use a strip of adhesive plaster to hold it in place if the bandage is not likely to make it sufficiently secure. Put on the bandage.

If the skin is abraded it will be better to use something to keep the gauze from sticking to the wound. *In hospitals, paraffin preparations, that are sprayed over the wound and become solid when they dry, are much used for this purpose, for they do not stick to the wound and can be readily lifted from it when the dressing is changed, also caps made of wire*

[1] When the gauze is arranged in this way it absorbs moisture from the wound better than when it is folded.

and sterilized are used, the cap being secured over the wound and the dressing put on over it, but such things are not likely to be at hand in homes and sterilized zinc oxid, purchased in a tube, is probably about as good as anything that can be kept for emergencies. Do not use the portion of ointment that comes first from the tube, remove it with the forceps or a piece of sterile cotton, and do not let the tip of the tube touch the portion of gauze that will come next the wound. Leave the gauze folded when ointment is used and let what will be the outer surface of the gauze, when it is over the wound, rest on the clean towel while you are spreading the ointment. The scissors can be used for the spreading if there is no sterile spatula at hand for the purpose.

Procedure when changing a dressing on a wound: Prepare as for a first dressing, minus the iodine and cleansing outfit, but, if the dressing has stuck to the wound, provide some warm boiled water and, if adhesive plaster was used, alcohol, if possible, though the warm water will answer.

Moisten the adhesive plaster where it is attached to the skin, preferably with alcohol, then pull each side in turn, quickly, toward the wound. *The removal of the adhesive does not hurt as much when the strips are pulled quickly as when they are dragged off slowly.* If the dressing has stuck moisten it with sufficient boiled water to allow of its easy removal, but use as little water as possible and none unless necessary. Wash away any dried blood from the

skin, preferably with alcohol, but boiled warm water can be used. Do not touch the wound unless you have been given special direction from a doctor; *the less a wound is touched or moistened the better.* Put on a fresh dressing.

CHAPTER XIV

Fractures. Dislocations. Sprains. Hemorrhage.

Nature of fractures. How bone is repaired. Symptoms and first aid treatment of fractures. Nature, symptoms, and treatment of dislocations and sprains. Nature and symptoms of hemorrhage. Natural resources of the body for arresting hemorrhage. First aid treatment of hemorrhage. Demonstration 28: First aid treatment of fractures and hemorrhage.

Equipment for demonstration: Slings.

Bandages.

Splints and substitutes such as a cane, umbrella, pieces of wood, thick cardboard.

Charts showing the skeleton and the circulation.

Material for improvising tourniquets such as handkerchiefs, pieces of muslin, and stones, and sticks.

Fractures

A fracture is what is commonly known as a broken bone. A fracture **usually results** from either a blow or fall.

In old age the bones break much more easily than in youth, and in infancy they are more likely to bend than to break, or a bone may become bent

and split on one side, a condition known as a *greenstick fracture*, because it resembles the manner in which newly formed green twigs of trees act when endeavor is made to break them.

The reason for this difference in fractures is that at birth the bones contain very little mineral matter and resemble what is known as cartilage, a tough, but somewhat elastic substance that will bend and stretch to some extent, but does not break in the same manner as bone. From the day of birth, however, there is a gradual deposition of mineral matter (obtained from food) in the bones so that all through life they are becoming harder but, as age advances, brittle.

Sometimes, when a bone is broken, a wound is also made in the soft tissues above the bone so that the latter is exposed to the open air. This constitutes what is known as a *compound fracture*, and it is a much more serious condition than a *simple fracture*, as a break is called when it is not complicated with other injuries. For one reason, infection is very likely to occur and then the union of the severed bones will be delayed and possibly prevented.

Bones heal because new cells, derived from those around the edges of the severed portions of bone, come into being and they, together with material which they excrete, and substances that exude from the blood-vessels, soon form a tough, fibrous material, known as *callus* that holds the severed ends together. Gradually, mineral matter, chiefly cal-

cium (lime) phosphate, is deposited in the callus, and hardens it so that, in about ten days from the date of fracture it will be fairly firm and, at the end of two months, if the person is healthy and there are no complications, the bone will probably be as hard as before it was broken.

The special symptoms of fracture are what is known as *crepitus*, which is the sound heard when the ends of the broken bone move against each other and there is likely to be a false point of motion, that is, the bone moves at the point of fracture. Also, there will be pain, redness, and swelling (due to the increased amount of blood that flows to the part as the result of the irritation) and, sometimes, a purplish discoloration (due to the extravasation of blood into the tissues from ruptured capillaries). Though the two symptoms first mentioned are the only ones not present in other injuries and, unless an X-ray picture is taken, the only positive signs of fracture, no attempt is to be made to discover them by anyone but a physician or surgeon for incompetent manipulation of severed bones may cause serious injury to the surrounding tissue. To avoid any chance of trouble, if the visible symptoms are pronounced, the part should be treated as though the bone were broken.

Treatment: Even if a surgeon cannot get to the patient for two or three days, an incompetent person should not attempt to reduce a fracture,[1]

[1] The words *reduce* and *set* are used for the restoration of the pieces of the severed bone to their normal position.

but should take means to keep the injured part perfectly quiet in a firm, flat surface and, if possible covered with an ice-cap or iced compresses (the cold tends to keep the local blood-vessels contracted and thereby to lessen congestion and swelling), and, if the injured part is a limb, bandaged to something that will act as a splint. The reason for the splint is that, even if the patient does not move voluntarily, the nerve impulses induced by the irritation cause muscular contractions that are likely to drag the portion of the severed portions of bone out of place, as shown in Fig. 78, and it will then be more difficult for the surgeon to set[1] the fracture properly. A straight piece of board makes the best temporary splint, and it will give the greatest degree of support if it is attached to the under surface of a limb, especially if this is a leg, but the limb should be moved as little as possible when the splint is passed under it and, if necessary to raise it, someone should hold it above and below the point of fracture so as to prevent movement of the severed bone. If possible the splint should be covered with some-

Fig. 78. Showing displacement of bones in a fracture.

[1] See note on p. 306.

thing soft and, it is even more important, after it is in place, to fill hollow spaces, as under the knee and ankle with something soft, even grass or moss can be used. If a board cannot be obtained anything firm can be substituted, for example, several layers of cardboard, or even a stick, cane, umbrella, branches of trees can be used, and, if nothing suitable can be found, an injured leg can be strapped

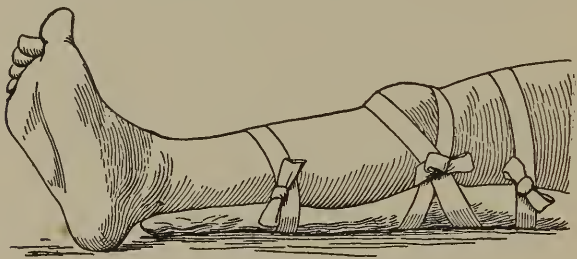

Fig. 79. An emergency splint for the leg.

to the uninjured one and a broken arm to the chest or the arm can be held in a sling and a stick attached as shown in Fig. 79 or if it is the forearm that is injured the stick should be attached to it.

Dislocations

A dislocation is an injury in which one of the bones of a joint is out of its socket. It is associated with stretching and tearing of the ligaments (the bands of fibrous tissue that hold bones together at the joints). **A dislocation may be caused by** a fall, or blow, or strain due to a forcible movement.

The joints most subject to dislocation are the shoulders, hip joints, lower jaw, thumb, and fingers.

The symptoms are: Deformity (due to the misplaced bone), severe pain, inability to move the

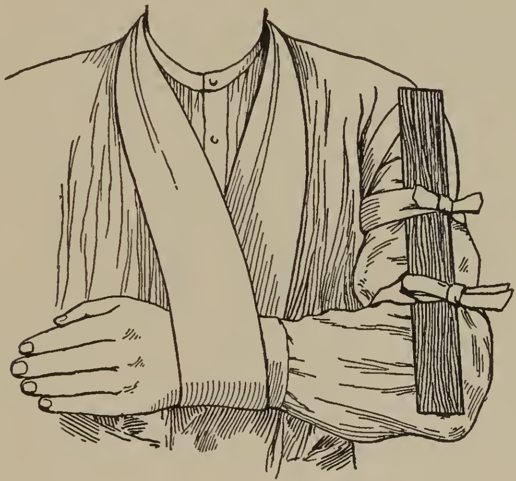

Fig. 80. Temporary splint for the arm.

joint properly, and there is usually swelling, and discoloration of the surrounding parts.

Treatment: The jaw and fingers are usually easily put into place and therefore if a surgeon cannot be found within a short time it is permissible to perform the operation, especially to get the jaw into place, for, when this joint is dislocated, the mouth cannot be closed and the pain is extreme. No attempt, however, should be made to

put a large joint into place, even if it is necessary to wait a day or two for a surgeon, for incompetent manipulation is likely to result in severe injury to the tissues which will make it more difficult for the surgeon to get good results and may cause permanent deformity and lack of mobility. Therefore, the first aid treatment is the same as for that of fractures, namely, to immobilize the part with a splint, sling, or bandage as required and apply cold.

To reduce a dislocation of the jaw: Have the patient sit upright with a firm support at the back of her head; put a compress or several layers of bandage or other protector around your thumbs, place them, one on each side, on the patient's back teeth, put your fingers under and behind the jaw, as shown in Fig. 81, and then press downward and backward while, at the same time, you push the chin upward. Be prepared to remove your thumbs the instant the jaw moves, because it is likely to snap into place suddenly, it is for this reason that the thumbs are protected. When the jaw is in place support it with a bandage such as shown in Fig. 74.

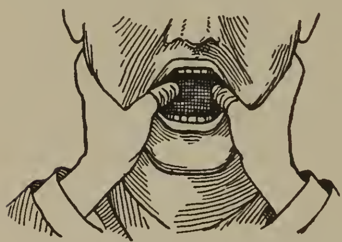

Fig. 81. Method of reducing a dislocated jaw.

To reduce a dislocation of the fingers or thumb, if a doctor cannot be found, make gentle traction

(pulling) on the finger or thumb and at the same time with the other hand move the bone into its proper position.

Sprains

A sprain is an injury to a joint consisting of more or less twisting or wrenching and, sometimes, tearing of the tendons (the fibrous cords which hold muscles to bones) and ligaments (the fibrous bands which hold the bones of a joint together), but, unless the sprain is complicated by a fracture or a dislocation, there is no break or displacement of a bone.

Sprains are caused by unnatural movements of a joint and occur most frequently in the ankle.

The symptoms are severe pain which is increased by motion, swelling, and more or less discoloration of the part and interference with movement. It will be noticed that the only symptoms of a fracture that are lacking are those for which only a surgeon should seek or even be likely to recognize. Therefore, if there is much pain or swelling in the injured part, treat it as if the bone were fractured until it is seen by a surgeon.

The first aid treatment for sprains consists in keeping the part quiet and elevated (*i.e.*, with one or two pillows under it) and covered with either cold or hot applications until the pain subsides, it is then bandaged. Moderate exercise is usually allowed. If the sprain is a severe one the surgeon

is likely to prescribe massage and to apply adhesive strapping before the part is bandaged.

Hemorrhage

The term hemorrhage signifies profuse bleeding. According to the nature of the vessel from which the blood escapes hemorrhage is known as *arterial*, *venous*, or *capillary*.

There are certain differences in these three forms of hemorrhage, namely: When the bleeding is from an artery, the blood is a very bright red and it is expelled in spurts, which correspond to the contractions of the heart, and enough blood may be lost from large arteries such as the femoral (in the thigh) and the brachial (in the arm) see Fig. 82, in about five or ten minutes to cause death. Blood from the veins is darker than that from the arteries, because it contains less oxygen, and it flows more slowly and in a steady stream, because, as the small capillaries are between the arteries and the veins, the flow of blood in the veins is not as directly influenced by the contractions of the heart as it is in the arteries. In capillary hemorrhage the blood oozes slowly from the surface of the wound or into the tissues. The discoloration seen in bruises is the result of capillary hemorrhage under the skin.

Symptoms of hemorrhage: Hemorrhage from small vessels, even arteries and veins, will usually be controlled or even cease without treatment

before enough blood is lost to induce systemic symptoms, but if sufficient blood is lost to deprive the tissues of their necessary oxygen and fluid and to interfere with the action of the heart the following symptoms appear: Pallor of the skin; weak, sighing breathing; thirst; restlessness; a longing for fresh air; dizziness; rapid, weak, irregular pulse; fall of temperature. As a rule, there is also the flow of blood from the wound, but, occasionally, even a large vessel may be severed without the production of an external wound.

The body is provided with certain natural resources that are of great help in controlling hemorrhage, namely: (1) The elastic nature of the blood-vessels which, when vessels are severed, causes them to contract and thereby reduces the size of the openings; (2) the blood tends to coagulate as soon as it comes in contact with air, or the tissues, or other foreign substance, such as the dressing of a wound, and the clots block the openings; (3) the heart action is weakened as soon as there has been any considerable loss of blood and less blood is then sent through the vessels.

The principal points to be observed in the first aid treatment of hemorrhage are: (1) Keep the patient quiet and reassure her, for movement, fear, or excitement will increase the rate of the heart action; (2) raise the bleeding part higher than the heart, because, as the blood must then flow to it against gravity, the force of the circulation in the wounded vessels is reduced; (3) if the hemorrhage

is from a vessel in the leg below the knee or in the forearm, in addition to raising the limb, flex it at the joint (knee or elbow) for this interferes with the flow of blood in the large vessels passing through the joints and it is through these that the vessels in the lower part of the limbs receive their blood; (4) expose the wound to the air, which favors clotting of the blood; (5) make pressure either on the bleeding vessels or on the large vessels of which they are branches, at the points indicated in Fig. 82. If the blood is coming from an artery make pressure between the wound and the heart; if the hemorrhage is from a vein it may be also necessary to make pressure between the wound and the periphery,[1] to prevent the escape of the blood that is already in the veins.

Pressure upon the bleeding vessels is spoken of as *direct pressure;* that upon the main vessels as *indirect pressure.*

Whenever possible, **direct pressure** is made, because hemorrhage is most easily controlled in this way. To make it, put on a sterile glove or encase your finger in a sterile compress and, putting it into the wound, press firmly against the bleeding vessels. Hold it thus until a surgeon comes or the bleeding ceases. In the latter case bandage tightly folded compresses into and over the wound. If the bleeding was at all severe, do not leave the patient until the surgeon has tied the severed vessels, for the slightest movement, even excite-

[1] The end farthest from the heart.

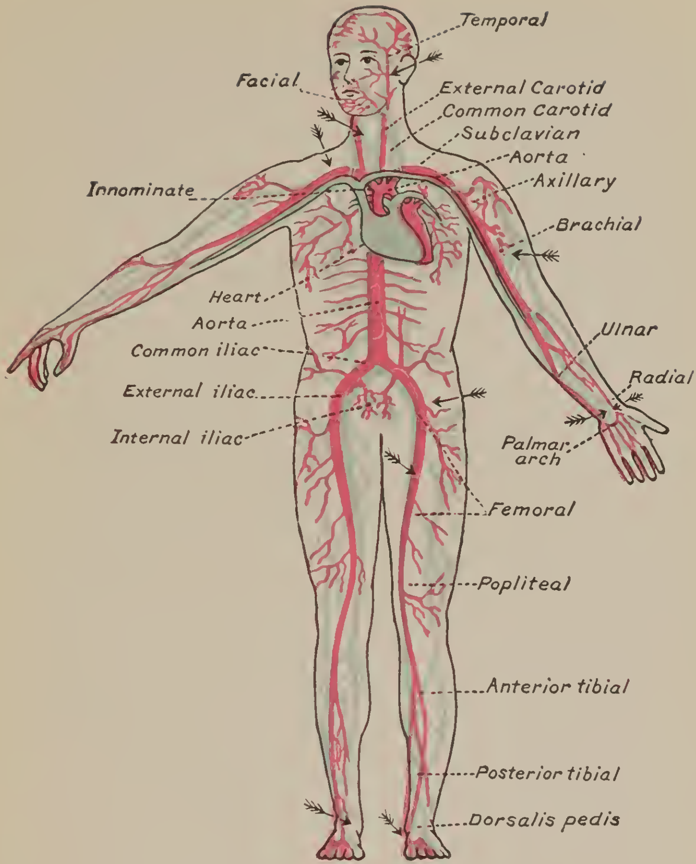

Fig. 82. Diagram showing plan of distribution of arteries and veins. The arrows indicate the points where pressure may best be applied.

ment, may dislodge the clot that arrested the hemorrhage and the bleeding recommence. As stated in the section describing the treatment of wounds, clean, soft muslin pressed with a hot iron can be used as a substitute for the ordinary surgical compresses used for dressing wounds.

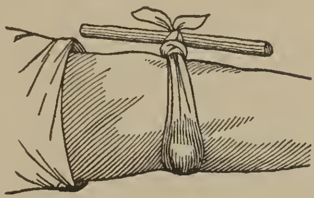

Fig. 83. Improved tourniquet made with a handkerchief, stick, and stone.

If there is nothing sterile at hand, **indirect pressure** must be made until sterile supplies can be obtained. Indirect pressure may be made with the fingers (digital pressure) or, on the limbs, with a tourniquet. In emergency a handkerchief, or a strip of muslin or any fairly strong material and a stick and stone or similar objects can be utilized for a tourniquet.

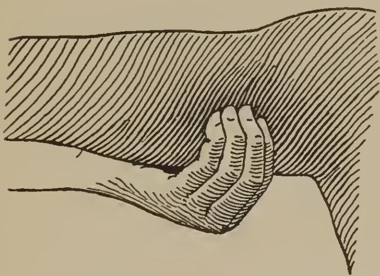

Fig. 84. Method of making digital compression.

To use such an improvised tourniquet put the stone in the center of the handkerchief and this over the artery supplying the bleeding part, tie the material, as shown in Fig. 80, place the stick over

the knot, tie it in place, and then twist the stick until the bleeding ceases.

The places on which to make pressure with the fingers or stone are shown in Fig. 82 and the following table:

To arrest bleeding from:	*Make pressure on:*
The scalp	The temporal arteries.
The face	The facial artery on the side of the bleeding.
The neck	The carotid artery on the side of the bleeding.
The shoulder or axilla	The subclavian artery.
The arm	The brachial artery.
The wrist or hand	Either the brachial or the radial and ulnar arteries.
The thigh	The femoral at either of the points indicated in Fig. 82.
The leg or foot	Either on the femoral artery, as for the thigh, or on the popliteal artery, by flexing the leg on a pad as shown in Fig. 85 or on the tibial artery.

A very important point to remember in connection with indirect pressure is that it cannot be continued for more than an hour without danger of causing gangrene (death of the tissue) in the part that is deprived of blood. Therefore, it is most important to get a surgeon and sterile supplies as quickly as possible. If a surgeon does not arrive at the end of an hour the pressure must be released, very slowly, sufficiently to allow the blood to flow into the part; if bleeding starts again, the pressure must be resumed after a few minutes, but it must

be released for at least a minute or two about every half hour until help arrives. As soon as sterile supplies are obtained pack the wound and apply a tight bandage, then, with the part in the proper position, as described on page 313, release the pressure to some degree, but very slowly, so as not to risk dislodging clots that may have formed by a rush of blood.

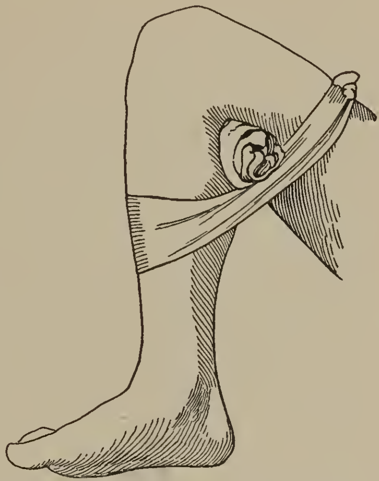

Fig. 85. Forced flexion of the knee to arrest hemorrhage in parts below it.

Hemorrhage from parts below the elbow or knee if not severe, can usually be easily controlled by placing a thick wad, of soft, but tightly rolled, material in the bend of the joint as shown in Figs. 85 and 86 and holding the arm or leg in position either with the hand or a bandage.

Heat and cold tend to check hemorrhage, heat because it hastens the coagulation of the blood and cold because it induces nerve reflexes that contract the blood-vessels. Therefore hot irrigations are often used to check hemorrhage in cavities and cold is very commonly used externally, for

example, an ice-cap is applied over the stomach for hemorrhage in that organ. A very important point to remember regarding the use of hot irrigations is that they must be as hot as can be employed without burning, which is about 120° F., for moderate temperatures tend to dilate the blood-vessels and favor hemorrhage.

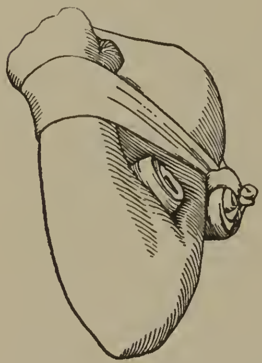

Fig. 86. Forced flexion of the elbow to arrest hemorrhage in the forearm or hand.

A number of **drugs, classed as styptics,** are sometimes used to check hemorrhage, which they may do by contracting the blood-vessels. One of these is acetic acid, which is contained in vinegar, and another is tannin, a constituent of tea leaves, therefore, either hot or iced vinegar or boiled tea (for which four or five times the usual amount of tea leaves are used) is very commonly employed to check bleeding from cavities.

For hemorrhage from the nose, make the person keep quiet with the head hanging backward, *never forward*, put something cold, as a piece of ice or a chilled door key at the back of the neck and either hold the nostrils compressed tightly, or put a wad of paper or cloth under the upper lip. If this treatment is not effectual plug the nostril from which the blood is coming with cotton wet with

either hot or iced vinegar or boiled tea. If this does not control the hemorrhage, get advice from a doctor.

For hemorrhage after extraction of a tooth, place a plug of tightly wadded gauze or suitable substitute in the cavity and press the teeth of the other jaw upon it, if the hemorrhage is not checked use a fresh plug moistened with vinegar or tea or substitute a piece of ice for the plug. If the bleeding is very profuse and is not checked by these means notify the dentist or a doctor.

For hemorrhage from the internal organs there is very little that a person not experienced in the care of the sick can do except send for the doctor, keep the patient quiet and in a position unfavorable for the flow of blood to the part, and, if possible, put ice-caps over the bleeding organ, and, if the hemorrhage is from the stomach give small pieces of ice by mouth, they must be swallowed as ice and not allowed to melt in the mouth. Ice is also often given when the hemorrhage is from the lungs, for, probably as the result of reflexes induced by the cold in the mouth, it sometimes has a beneficial effect; at any rate it does no harm and it helps to make the patient feel that something is being done for her. Blood coming from the lungs has a frothy appearance because of the air mixed with it and, therefore, hemorrhage from the lungs is easily distinguished from that coming from the stomach.

Demonstration 28

First Aid Treatment in Hemorrhage and Fractures

Procedure: The pupils should first study the course of the blood-vessels on the charts and practice stopping the pulse by digital pressure, this is best done on the arm as follows: Make pressure with the fingers of one hand on your neighbor's brachial artery and keep the fingers of your other hand on the radial artery. Make sufficient pressure to arrest the pulse in the radial artery. Cessation of pulsation of the artery shows that blood is no longer flowing into it and thus, where there is a hemorrhage below the point of pressure, it would be arrested.

After all the pupils have tried this and ascertained how to manipulate an improvised tourniquet let some of the pupils act as subjects and pretend to have, either a hemorrhage or fracture, or both, and let others treat the subjects according to the direction just given, acting in all respects as though the emergencies were real.

CHAPTER XV

Fire. Burns. Scalds. Frost-bite. Chilblain

How to put out fires. How to escape and help others escape from burning buildings. Demonstration 29: Extinguishing flames from the clothing and use of fire extinguishers. Various causes and treatments of burns. Treatment of scalds. Nature, causes, and treatment of frost-bite and chilblain. Other consequences of exposure to cold.

Equipment for demonstration: Blankets or substitutes and if possible, different varieties of fire extinguishers.

Much unnecessary suffering, loss of life, and destruction of property is constantly occurring because people do not do the right things when a fire starts. **To realize what should be done both to put out fires and to escape from fires and their consequences the following facts should be known:**

(1) Burning consists in the union of oxygen with matter and, therefore, if air is excluded from burning material the fire will be extinguished. Air can be excluded by pressing something hard or thick, as wood, rugs, blankets, **tightly** upon the burning material, or by covering the latter with carbon dioxid, which is heavier than air and therefore does not diffuse readily. This is what is done

when the majority of fire extinguishers are used, for these contain chemicals that interact when poured over the flames and liberate carbon dioxid.

2. Movement of air, such as is created by a draft or a person running, favors the spread of fire; it will also hasten the diffusion of the carbon dioxid poured over a flame.

3. Wet material, provided the moisture is not due to an inflammable substance, as ether or oils, has a much higher kindling temperature than dry and will not take fire readily.

4. Many of the deaths that occur when people are trapped by fire, especially in crowded buildings, are due to asphyxia caused by the inhalation of smoke. As smoke is lighter than air it rises, therefore, there is practically no smoke within about six inches of the floor.

5. Another common cause of death following accidents due to fire is shock, and death from this cause has often occurred when there has been relatively little external injury. Probably the chief reason for this is that the intense terror experienced is conducive to shock, but also creates excitement, which retards the onset of the conditions constituting shock, but increases their intensity later, especially if the person is allowed to move around, as is likely to be the case when the internal injuries are not extensive.

Procedure in putting out a fire: If anything in the room catches fire, *at once* bang something hard upon it or envelop it tightly in a rug, heavy coat,

blanket, or the like. If this is not effectual shut the doors and windows (to prevent a draft); send someone to summon the fire brigade and, if possible, get and use a fire extinguisher, otherwise, except when the flame is due to burning oil, get water and pour it over the flaming material. Water should not be used to extinguish burning oil, for it will not do so and, as oil floats on water, it will spread the flame. Good things to use to extinguish burning oil are the fire extinguisher, clay, sand, ashes, or wet blankets pressed tightly upon the burning mass.

To avoid becoming asphyxiated when surrounded with smoke tie something, wet if possible, over your nose and mouth and, if there is much smoke, crawl to safety on your hands and knees, keeping your face near the floor. Try to make others do likewise and do not get excited.

If your clothes catch fire, do not run for help, because this will favor the spread of the flames, but, if the ignited area is small, immediately make hard pressure against it with something hard, as wood or the wall, if this is not at once effectual lie down on the floor and draw the rug tightly around you, or, if there is no rug, anything that can be used as a substitute (*e.g.*, bedclothes, or a heavy coat, or blanket) and if, when lying still, you do not press on a sufficient area to smother all the flames, roll slowly on the floor in such a manner that you will press upon all the burning parts. It is most important to lie down because, as the

flames and smoke rise, the fire will spread over your clothing more rapidly when you are in the erect position.

If anybody else's clothing catches fire help or force her to carry out the preceding directions.

When enveloping a person in a blanket, etc., or when drawing one around yourself, put it first between the flames and the face, otherwise, you are likely to fan the flame toward the latter.

Demonstration 29

Extinguishing Fire

Procedure: Some of the pupils should pretend that their clothes are on fire and others put the preceding instruction into effect.

Burns. Scalds

A burn is generally defined as a lesion of tissue induced by heat, but similar lesions, also commonly known as burns, are produced by other agents such as the X-rays, the chemical rays of the sun, various chemical substances such as strong acids and alkalies (especially caustic soda and potash and lime) and irritating substances such as mustard and iodine.

Burns are usually classified according to the amount of tissue destroyed as being of the first, second, or third degree. A burn of the first degree

is one in which the skin is reddened, because of slight congestion in its blood-vessels, but is not actually injured. A burn of the second degree is one in which there is inflammation of the skin and blisters. Blisters are due to the exudation of fluid from the congested blood-vessels which raises the outer layer of skin from the underlying tissue. Burns of the third degree are those in which there is charring and destruction of both the skin and deeper tissues.

The only treatment necessary for a small burn of the first or second degree is to cover the part with something clean and non-irritating that will exclude the air and will not adhere to the skin. Examples are: A compress of soft muslin covered on one side with an emollient such as boric acid ointment, or zinc oxid ointment, or cold cream, or the compress may be saturated with a bland oil (such as olive or linseed oil) or with a solution of sodium bicarbonate (made by dissolving about a teaspoonful of baking soda in a cupful of water). When the solution is used the compress must be moistened at intervals because the liquid will evaporate and the muslin will stick to the wound.

If the burn is at all extensive send for the doctor, if only because of the danger of shock. Do not, however, wait his arrival to cover the burned area, because the destruction of skin leaves the nerve endings exposed and, until they are covered with something that will prevent their stimulation, the pain is likely to be excruciating. A dressing such

as any of those mentioned may be used or the burned part may be immersed in cold water or a solution of sodium bicarbonate made as described in the preceding paragraph. When dressing a burn use small compresses so that when the dressing is changed a large area need not be exposed at a time for the pain is thereby increased.

The term scald is applied to an injury due to moist heat. The nature and treatment for scalds are similar to those of burns.

The treatment for burns due to other agents than heat is the same as for the latter plus, in the case of those due to a chemical, the removal of the substance and, if the chemical is an acid or an alkali, its neutralization. To neutralize an acid, use an alkali, such as a solution of sodium bicarbonate (baking soda) or sodium carbonate (washing soda) diluted ammonia water, lime water, or strong soap suds. For carbolic acid (which is not a true acid) use alcohol. For alkalies use a diluted acid, preferably lemon juice or vinegar. If the neutralizing agent cannot be obtained immediately hold the part under running water, so that the acid or alkali will be diluted and washed off and its action thus minimized, but use the neutralizing agent as soon as possible.

Burns from mustard are almost always due to the improper use of this substance in pastes and poultices, either too much mustard is used, or the application is left on too long, or the skin is not washed after the application is removed and the

adherent particles of mustard continue to act. **The treatment consists** in removing the mustard by irrigating and gently patting the part with warm dilute soap suds and then warm water, drying it, and applying a dressing of bland oil or an ointment such as those previously mentioned.

Tincture of iodine is most easily removed with ammonia water, but alcohol or warm soap suds will answer fairly well. If the skin is blistered or seems likely to become so apply a bland oil or ointment.

Consequences of Exposure to Cold, Freezing, or Frost-bite. Chilblain

Cold depresses living tissue, whether vegetable or animal; it lessens the movement of the molecules of which protoplasm is composed, and, thereby, causes contraction of matter and inhibits all vital (life) processes. If the cold is not excessive, however, or exposure too prolonged, as stated in Chapter VI, cold, by stimulating nerve endings in the skin, produces conditions that protect the body from its depressant influence. If, however, exposure to intense cold is prolonged, the blood is driven to the interior of the body; the surface of the body becomes stiff, contracted, and pale, especially the more exposed parts and those in which the circulation is first interfered with, namely, the face, hands, and feet, if the exposure continues the circulation of blood in the brain is inhibited and the person becomes drowsy and finally unconscious.

Localized areas, especially parts of the face, hands, and feet may be severely frozen, however, without the onset of symptoms of general depression, especially if the individual is exercising and warmly clad.

In the first stage of freezing, the affected part is blue, numb, and stiff, later it becomes white and rigid and, if this stage is allowed to progress, the vitality of the cells may be so reduced that the tissues will never recover, but gradually slough and die, that is, they become gangrenous.

The walls of the blood-vessels in a frozen part are in such a condition that, when the part is thawed, they cannot respond to nerve impulses and contract, and this, as the circulation is restored, interferes with the flow of blood through them, thus they become congested and, consequently, the part becomes red and swollen, and there is excessive exudation of fluid into the tissues and between the true skin and the outer layer of skin; this separates the latter from the underlying structures and forms blisters.

If the flow of blood to a frozen part is increased quickly the conditions described in the preceding paragraph will be worse than if the circulation is restored gradually and the vessels are given time to resume at least a moderate degree of contraction. Thus it can be seen that **the severity of the after-effects of freezing depend** upon the intensity of the freezing and the rapidity with which thawing is promoted.

Chilblain: After a part has been frozen, exposure to even a moderate degree of cold is likely to induce a condition similar to the after-effects of freezing in which the part becomes red or mottled and more or less swollen, and is intensely itchy and, especially if the chilled part is warmed quickly, small blisters may form. This condition is known as *chilblain.* People with poor circulation may suffer from chilblain even when the affected part has never been frozen.

The aim of the primary treatment of frost-bite is to restore the circulation in the affected part gradually. Formerly it was customary to rub the part with snow or iced water, but this is not now considered the best treatment; instead, the person is kept in a cool room (about 65° F.) and the frozen area is *very gently* rubbed and, if possible, immersed in water that has a temperature of about 65° F. After a time the temperature of the water is gradually increased, by the addition of slightly warmer water; until it is about 90° F. No definite directions can be given regarding the rate at which the temperature is to be increased, it depends upon the severity of the freezing and the way in which the tissues respond to the treatment; severe freezing and the onset of much congestion require slow increase of temperature. If the frozen area is at all large or if there are symptoms of general ill effects from the exposures, a doctor must be consulted and the patient put to bed and, if necessary, treated for chills and shock, except that heat must

not be applied at first and, of course, it must never be put near the frost-bitten areas.

The after treatment of frost-bite is usually the same as for burns, but, if the injury is at all severe, a doctor's advice should be sought. It is to be remembered that the treatments mentioned in this book are only those which can be given by inexperienced people and that there are more complicated, but also more effectual, measures that are likely to be needed in serious cases of either burns or frost-bites.

To allay the unpleasant sensations induced by chilblain rub the parts with spirits of camphor or alcohol. Denatured alcohol (that containing substances which make it poisonous to drink) can be used for this purpose, the poisons employed not being harmful to the skin.

CHAPTER XVI

Removal of Foreign Bodies and Treatment of Poisoning

Methods of removing foreign bodies from the eye, ear, nose, throat, bronchial tubes, and alimentary canal. Nature of poisoning and the first aid treatment for poisoning by some of the more common poisons.

Removal of Foreign Bodies from the Eyes

Nature has provided the eyes with three very effective means of protection from injury by foreign substances; these are the eyelids, eyelashes, and the secretion of the lachrymal or tear glands.

These glands are in the bony cavities, known as the *orbits*, that hold the eyes and are situated just above the eyeballs at their outer sides. They secrete a watery fluid known as the *tears* which passes through small tube-like passages, termed *ducts*, to the free surfaces of the eyeballs. The glands are constantly active and their secretion keeps the eyeballs moist. Ordinarily we are not aware of the presence of this fluid because it evaporates very rapidly and any excess passes into minute ducts, at the inner side of the eyeballs, which lead into thc nose. When, however, the

glands are stimulated, as they are when any foreign substance enters the eye, and by psychic conditions, as anger, not only does a large amount flow across the eyeballs into the nose but overflows the lower lids on to the cheeks.

If, when anything gets into a person's eye, nature's provisions, the tears, lids, and lashes were depended upon for its removal, less trouble would be caused, but the almost invariable custom is to immediately rub the eye, which treatment frequently either moves the substance further under the lids or embeds it in the conjunctiva (the membrane covering the free surface of the eye and lining the lids) and often gives rise to serious trouble.

Therefore, if dust, a cinder, or other foreign substance gets into the eye wink the lids briskly, for this movement is likely to dislodge the speck and, at the same time, blow the nose forcibly, and, if necessary, smell something, as pepper, that will make the eyes water.

If these efforts are not successful, and the speck is under the upper lid, grasp the lashes of this lid and draw it downward so that the lashes of the lower lid will brush against its under surface.

If this is not effectual either separate the lids, as in Demonstration 17, or get someone to evert the lid, as described later, and try to brush off the speck, with the corner of a clean handkerchief. If it does not come off readily irrigation of the eye, as in Demonstration 17, can be tried. If these measures are not effectual, a doctor should be seen.

To evert (turn back), the upper lid and expose the under surface, have the patient sit with her head tilted backward, stand behind her and hold a match or similar article across the lid (do not press on the eyeball), take the lashes between the thumb and first finger of your hand and turn the lid backward over the match.

This procedure is quite easily done after a little practice, though it is rather difficult to get the knack, and the pupils should practice it. They can stand in front of a mirror and each one do it on herself.

Removal of Foreign Bodies from the Ear

In the case of adults it is usually small flies or insects that get in the ears, but children are inclined to put such things as peas, buttons, small stones, and the like in their ears.

Filling the ear with liquid, oil especially, will usually kill an insect and it will then float to the top and, if the head is bent so that the ear being treated is downward the insect will be washed out. The liquid can be poured into the ear from the bottle or a medicine dropper.

Hard objects can usually be picked out with the fingers if they have not been pushed in too far. In the latter case, syringing the ear can be tried as described in Chapter VIII, but under no circumstances must the object be poked at for the membrane between the outer and middle ear is

very easily ruptured. In fact, unless it is difficult to get a doctor, it is better for an inexperienced person not even to try the syringing. Alcohol should be used instead of water or the solutions in Chapter VIII, when the foreign body is anything, such as a pea or bean that will absorb water and swell; alcohol tends to shrink such substances.

Removal of Foreign Bodies from the Nose and Other Air Passages

Children quite frequently poke hard objects into the nostrils. To remove one, press your finger on the empty nostril and make the child blow its nose hard. If this is not effectual, unless there is someone present who knows how to give a nasal irrigation, take the child to a doctor.

The entrance of foreign substances into the trachea (windpipe) is not an uncommon accident. The usual causes are, vomiting while under the influence of an anesthetic, and speaking or laughing while there is something in the mouth. The reason that the accident occurs so readily is that the esophagus (the tube-like passage leading from the throat to the stomach) is behind the trachea (the windpipe) and therefore anything swallowed or vomited has to pass over the latter. The motion of swallowing, however, draws a small membranous cover attached to the back of the tongue (called the epiglottis) over the opening of the larynx (the upper distended part of the windpipe) and prevents

food getting into it, but the movements of the tongue and throat muscles when an individual is laughing and talking are quite different from those made when swallowing and the glottis (the opening) is left exposed.

The entrance of anything into these air passages induces such coughing that the object is likely to be ejected without treatment, if it is not, slap the patient on the back, as this tends to dislodge any foreign substance in the larynx or trachea and, if this fails, invert the patient. With an adult, this is best done by laying her across a couch or bed with the upper part of her body bending over its side, but a child can be taken by its feet or knees and held upside down. Continue to give hard slaps upon the back. If the trachea is sufficiently blocked to cause symptoms of asphyxia and the object is not immediately coughed up, a doctor should be called at once and, even though the asphyxia is relieved, if the object is not coughed up, a doctor should be consulted because the relief of the asphyxia may be due to some change in the position of the object which lessens interference with breathing and, if left alone, the object may pass down into the lung and cause serious trouble.

Foreign Matter in the Alimentary Canal

Another not uncommon accident, especially in childhood, is swallowing hard or sharp objects which cannot be digested. The latter are the more

dangerous as it is quite possible for them to pierce the wall of the stomach or intestines. Even the former, however, if large, may cause trouble by blocking some of the constricted portions of the alimentary canal, therefore, a doctor should be consulted. To lessen the danger of trouble from sharp objects, large amounts of soft food, such as mush, potatoes, and cornstarch preparations should be given as soon as possible. No cathartic should be taken until ordered by the doctor.

Nature of Poisons and First Aid Treatment for Poisoning

A poison is generally defined as any substance that, in relatively small amounts, may cause death or disease.

As previously stated, poisons may be taken into the body (ingested) or formed within the body. Only the former will be considered here.

Ingested poisons are usually either chemicals used as medicines or in industries, poisons, plants, or toxic substances developed in food as the result of decomposition.

A poison may be taken by accident or deliberately, with the intent to commit suicide, also, it may be administered by mistake or with criminal intent.

Poisons are sometimes classified under two primary headings, namely, those which produce harmful effects in the alimentary canal and those

which act only after they have been absorbed by the blood and carried about the body. The latter class is subdivided into (1) those which act as depressants (drugs used to induce sleep and to alleviate pain) and those which act as stimulants, but even stimulants, in poisonous doses, usually cause death by depressing either the nervous system or the heart muscle or both, because over-activity of any part of the body is followed by its fatigue and consequent inability to function properly and the nervous system and in some cases, the heart muscle are more easily affected by such drugs than other tissues. Depression of these parts of course results in shock.

Death from poisoning is nearly always due either to shock or to interference with breathing, and the interference with breathing is usually the result either of depression of the respiratory center or of spasmodic contractions of the chest muscles during convulsions.

Irritant drugs (examples of which are given on page 341) will cause shock by their actions in the alimentary canal; these are: Intense inflammation and, sometimes, corrosion of the membrane lining the canal, excessive vomiting and diarrhea. The reasons why such actions induce shock were mentioned in the section describing the causes of shock. Some of them also depress the nervous system after absorption.

The local action of irritant drugs will be in proportion to their strength; for example, a teaspoonful

of 50 per cent. hydrochloric acid will do infinitely more harm to the membrane with which it comes in contact than three times that amount of 10 per cent. hydrochloric acid, but a poisonous dose of strychnine will be as poisonous in a quart of water as in a teaspoonful of water.

Symptoms of poisoning: It would be almost impossible for anyone not accustomed to observing the effects of drugs to remember or recognize all the symptoms of poisoning produced by individual drugs and, therefore, only those characteristic of the different types will be mentioned here.

The characteristic symptoms of poisoning by irritants are: Intense abdominal pain, nausea, vomiting, diarrhea and, after a time, there will probably be blood and shreds of mucous membrane in the vomitus and feces and, later, in the urine.[1] The mucous membrane of the mouth and throat will be intensely red and sometimes swollen and, especially if a corrosive drug, as a concentrated acid, has been taken the membrane may look as though it had been burned, and it may be discolored. Also, the symptoms of shock mentioned on page 263 will soon be apparent. There may be convulsions.

The characteristic symptoms of poisoning by

[1] Almost all drugs and other poisonous substances are eliminated chiefly through the kidneys, and even irritants that are too thoroughly diluted by the blood after they are absorbed to injure other tissues may affect the kidneys and other urinary organs because they are here once more present in concentrated amounts, though, of course, not quite as much so as in the alimentary canal.

the majority of depressant drugs (those used to relieve pain and induce sleep) are profound stupor; slow, shallow breathing; the symptoms of shock; and, as the breathing becomes insufficient, the symptoms of asphyxia become more or less pronounced.

In poisoning by opium and its alkaloids[1] the symptoms are somewhat different from those induced by other depressants because these drugs depress the parts of the brain concerned with sensation and breathing more, and other parts less, than the other depressants. The chief differences are: The breathing becomes excessively slow in the early stages of poisoning and, therefore, the symptoms of asphyxia are especially marked while the symptoms of shock are not observed until shortly before death; in fact many patients cease breathing while the pulse is still fairly strong; and if the patient is kept walking about or otherwise aroused, stupor is less profound than that induced by the other depressants; the pupils of the eyes are contracted until shortly before death when they dilate widely.

Characteristic symptoms of poisoning by poisons that cause death by overstimulating the nervous system are: Muscular twitching, convulsions, and, sometimes, delirium. Finally there will

[1] Alkaloids are organic, nitrogenous substances that combine with acids to form salts. A large number of the most poisonous drugs owe their effects to these substances. Well-known examples are: Morphine and codeine (derived from opium), strychnine (from nux vomica), atropine (from belladonna).

be stupor and the symptoms of shock but these will not occur as quickly as in poisoning by depressants. Commonly used drugs which act in this manner are: Strychnine, nux vomica, belladonna, and atropine.

The symptoms of poisoning by poisonous mushrooms and some putrefied foods (*ptomaine poisoning*) **are:** Intense abdominal pain, nausea, vomiting, purging, the symptoms of shock, thirst becomes extreme, and, especially if the patient is a child, there may be convulsions.

There is also a form of food poisoning, known as *botulism*,[1] that is caused by eating food infected with a microörganism, the *bacillus botulus*. Sausages and canned meats and vegetables, especially peas and beans, that are not well sterilized when prepared are common causes of poisoning, because these foods are quite frequently infected with the organism, and, if it is not destroyed, it multiplies and increases in virulency during the period that the foods are preserved. The symptoms do not usually appear for some hours after the infected food is eaten and they vary considerably according to the degree of infection. They are likely to be digestive disturbances followed by collapse, extreme dryness of the mucous membrane of the mouth and throat, dilation of the pupils, and there may be convulsions or paralysis.

Treatment for poisoning: Send for a doctor instantly and, if anybody who knows how to wash

[1] Latin *botulus* = sausage.

out the stomach can be reached quicker, get her or him, for lavage (washing out the stomach) is one of the first and most important things to be done in the treatment of practically all poisoning when the poison has been taken by mouth and, in the case of some drugs, especially opium and its alkaloids and arsenic, even when the drug has been taken in other ways, as by a hypodermic injection, because these drugs are excreted into the intestines, as well as through the kidneys.

The treatment that an inexperienced person should give while awaiting help is as follows:

For poisoning by irritants: (This includes some of the most common causes of poisoning, the chief ones are arsenic compounds; corrosive acids, including carbolic and oxalic; corrosive alkalies, which includes many compounds of sodium, potassium, and calcium or lime, and bichloride of mercury.) Dilute the poison at once (it is to be remembered that the irritant action of these compounds is in proportion to their concentration and, if they are diluted promptly their ill effects will be minimized); if possible use the chemical antidote (mentioned later) or milk or white of uncooked egg for the dilution, but, if water can be obtained quicker, give water and get the other liquids later, *not a second must be lost.* The milk and egg coat the surface of the membrane lining the alimentary canal and protect it from the action of the irritant, also their albumin combines with a number of the irritant drugs and reduces their irritant properties.

Other good protectors for the membrane are starch water[1] and gelatine dissolved in warm water. Give as much of these protective fluids as possible, even though they are vomited.

By a chemical antidote is meant a substance that will combine with a poison and change it to harmless or, at least, a less harmful compound. There are only certain poisons, however, for which such antidotes are known.

The chemical antidote for acids (except carbolic acid) are alkalies.[2] The best alkali to use is milk of magnesium (one to two tablespoonsful, according to the amount of acid taken), but, if magnesium cannot be obtained, sodium bicarbonate (*baking soda*), sodium carbonate (*washing soda*), (quarter to half a teaspoonful in half a glass of water), ammonia water, soap, wall plaster, lime water (one to two glasses full) can be used. An objection to the carbonates is that, when they come in contact with acid, they liberate carbon dioxid gas and, if the stomach is corroded by the acid, this may be harmful. Ammonia is irritating and therefore should only be used if other alkalies cannot be obtained, if necessary to use it, dilute it well, using

[1] To make the paste mix two teaspoonsful of cornstarch with cold water, add about a cupful of boiling water slowly, stirring the mixture as you pour on the water; boil the mixture for at least five minutes and then cool it and make it thin enough to drink by adding cold water or, preferably, milk.

[2] Acids and alkalies interact and form salts. Carbolic acid is not a true acid and does not combine with alkalies but it does with alcohol.

about one teaspoonful in a glassful of water. Do not use the soda compounds for poisoning by oxalic acid because the sodium oxalates (salts of oxalic acid) are about as poisonous as the acid.

The chemical antidote for carbolic acid is alcohol. It is generally given in the form of whiskey or brandy, but wines can be used, though they must be given in larger amounts. Though alcohol prevents the local action of carbolic it hastens the absorption of the drug and does not prevent the action of carbolic after absorption, therefore, if nobody to wash out the stomach can be found, after giving alcoholic drinks freely, and a protective as white of uncooked egg, cause vomiting in one of the ways described later, except by the use of mustard, which is too irritating to use in the treatment of poisoning by an irritant.

The chemical antidote for bichlorid of mercury and other metal salts is albumin, which is contained in white of egg and milk.

The chemical antidote for alkaloids is tannin. This is contained in tea leaves and, if the leaves are boiled, a considerable amount can be extracted. As previously stated the poisonous principles of a large number of the vegetable drugs are alkaloids.

When the patient is discovered before she is having convulsions or the symptoms of shock are pronounced, the first thing to be done in the **treatment for poisoning by drugs that act after absorption** is to cause vomiting. **Vomiting can be induced** by tickling the back of the throat with your finger,

a stick, feather, pencil, etc., or by giving an emetic (*i.e.*, a remedy that causes vomiting). Mustard, one teaspoon in half a glassful of water, is one of the most efficient emetics that anyone not acquainted with the use of drugs can use, but salt, one teaspoon in a glassful of tepid water, or tepid water alone will often induce vomiting. As soon as the patient has vomited give strong boiled tea, then induce vomiting again and if the poisoning is due to a depressant, give more tea and strong coffee (for the sake of their caffeine) but do not use these, except the tea that is vomited (which is used for its tannin) when the poisoning is due to the nerve stimulants mentioned on page 340, because they contain caffeine which is a nerve stimulant and would therefore increase the harmful effects. For these give sodium bromide thirty grains in about a quarter of a glass of water.

If the symptoms of collapse are pronounced, or the patient is having convulsions, except in the case of poisoning by opium and its alkaloids, do not give an emetic, for, as the drug must have been absorbed if the conditions of poisoning are pronounced, vomiting will do little good and may do harm. Therefore, all that can be done until help arrives, in the case of poisoning by depressants, is to treat the patient for shock and give all the strong coffee possible; if the patient cannot take it by mouth give it by rectum, you can do so with a long-nozzled syringe, or by inserting a rectal tube, or, if one is not at hand, a piece of rubber

tubing about four to six inches in the rectum (according to the size of the patient) and pouring the coffee very slowly into this. If possible put a funnel in the free end of the tubing as this will facilitate pouring in the coffee, or a fountain syringe bag with its attached tubing can be used. Grease the tubing with vaselin or cold cream or other lubricant before inserting it in the rectum. Do not hold the funnel or bag more than twelve inches above the rectum. Give artificial respiration if necessary.

If the patient is having convulsions as the result of poisoning by nerve stimulants it is most important to get help immediately because, especially in the case of strychnine poisoning, the patient usually has to be given an anesthetic before treatment can be given, for the slightest stimulus, any movement, a light, a noise, may cause a convulsion. While waiting for help see that the patient is kept very quiet in a darkened room.

The principal items in the **first aid treatment for poisoning by opium and its alkaloids are:** Empty the stomach repeatedly, at intervals of about every half hour (these drugs are alternately absorbed and eliminated back into the intestines); give a cathartic—magnesium sulphate (epsom salt), half ounce (two tablespoonsful) in about half a glass of water, is generally considered one of the best cathartics to use for the purpose; keep the patient awake by, if possible, walking her up and down and giving her strong coffee. If you cannot keep

her awake until help arrives, it will probably be necessary to give artificial respiration.

The first aid treatment for poisoning by **poisonous foods** is to cause vomiting, as described on page 343; to treat the patient for shock; to give all the liquid possible, including tea and coffee, and a large dose of castor oil.

It is to be remembered that in all cases of poisoning, lavage of the stomach is better than an emetic because it is less depressing to the patient and it removes material from the stomach more thoroughly. It is also to be realized that the treatment described in these pages only includes the measures that can be carried out by a person inexperienced in the use of drugs and the care of the sick and that a doctor, and, though to a lesser extent, a nurse or druggist can give further treatment. Therefore, help must be sent for at once, but the measures given here must be taken in the meantime, for every second lost in diluting an irritant drug increases the injury to the tissue and thus increases the chances of death or, if the patient is saved, life-long trouble from the scars that will form in the alimentary tract; and, if non-irritant poisons are removed by lavage or vomiting before they are absorbed, the individual may not be any the worse for having taken the poison, but, many of these drugs are absorbed so quickly that the conditions of poisoning will be present in from five to twenty minutes.

From what has been said regarding the treat-

ment for poisoning it can be seen that the **aims of the treatment are:**

(1) To dilute irritant drugs.

(2) To remove the drug.

(3) To use something that will render the drug harmless or at least less harmful.

(4) To take means to overcome the bad effects that the poison has produced.

GLOSSARY

Abnormal. Not normal; not according to the usual condition.

Acute. Short; rapid; having a short and relatively severe course, the opposite of chronic.

Agglutination. Sticking or gluing together.

Alimentary Canal. The canal through which the food passes and is digested. It consists of the mouth, pharynx (throat), esophagus, stomach, and intestines.

Alleviate. To mitigate, to lessen.

Amputation. The removal of a part of the body.

Analogous. Having the same function or meaning.

Anemia. An abnormal condition of the body in which there is either a deficiency of blood—as following hemorrhage—or a deficiency of red blood corpuscles or of hemoglobin.

Anesthetic. A drug that produces anesthesia, i. e., lessened sensation.

Anterior. In front of.

Antiseptic. An agent that prevents the activity and multiplication of microörganisms.

Antitoxin. A substance that will destroy the toxins (poisons) produced by bacteria. Such substances are produced in the animal body as the result of infection by bacteria or their toxins.

Anus. The opening to the external end of the rectum, i. e., the lower part of the bowel.

Apposition. The state of being fitted together.

Arteries. The blood-vessels through which the blood flows from the heart to the capillaries.

Asepsis. Absence of septic matter, freedom from infection.

Asphyxia. Suffocation.

Assimilation. To absorb or incorporate; the transformation of food derivatives into living tissue, i. e., constructive metabolism.

Astringent. A substance which produces contraction of the tissues and lessens secretions.
Atrophy. The wasting or diminution in the size of a part.
Auditory. Pertaining to hearing.

Base. The foundation; the chief ingredient of a compound; a metal element or compound that will unite with an acid to form a salt.
Basic. Pertaining to a base.
Bronchi. The bronchial tubes which extend from the trachea (windpipe) to the lungs.

Capillaries. The small blood-vessels between the arteries and the veins; small lymph vessels.
Complicated. Complex; associated with another disease or injury.
Condense. To make more compact or concentrated.
Condiment. A seasoning or sauce used to improve the flavor of food.
Conduction. The act of conveying or leading.
Congestion. An excessive accumulation of blood in a part.
Contagion. The contraction of a disease by contact with infected matter or with a person suffering with the disease.
Contiguous. Close together.
Contused. Bruised.
Converge. To come to a point or close together.
Corrosion. The process or act of disintegrating or wearing away by degrees.

Defecation. The discharge of feces from the rectum.
Demulcent. Bland; soothing.
Dense. Thick; compact.
Denude. To lay bare; to remove the covering.
Depressant. Anything that diminishes the force or strength of a body.
Detergent. A cleansing agent.
Diffuse. To spread.
Diluent. An agent used to dilute or render a solution, etc., less concentrated.
Disinfectant. An agent that will kill microörganisms.

Distal. Remote from the center or origin.
Drastic. Severe; a powerful purgative.
Duct. A channel or tube for the passage of secretions or excretions from a gland.

Eczema. A non-contagious inflammation of the skin characterized by lesions of various kinds.
Efferent. To carry outward.
Eliminate. To expel.
Emetic. A drug or other agent that causes emesis, i. e., vomiting.
Engorged. Congested.
Enzymes. Organic substances that are produced by living cells and act as catalyzers, i. e., they hasten chemical reactions, but do not themselves enter into the reaction.
Epidemic. A disease that spreads rapidly through a community or becomes widely diffused.
Epidermis. The outer skin.
Excreta. Waste matter discharges from the body.
Extravasation. The escape of blood or fluid from a vessel.
Exudation. The passage of fluid through the walls of the blood-vessels.

Feces. The waste matter that is discharged through the intestines.

Gray matter. The part of nervous tissue which contains the cell-bodies.

Host. Any organism or plant upon which another organism lives parasitically.

Immune. Protected against any particular disease.
Incompatible. Not suitable for combination.
Infection. The communication of disease from one person to another; the implantation of disease; contamination.
Ingest. To take into the stomach.
Inherited. Obtained from an ancestor.
Innervation. The distribution of nerves in a part.
Inoculate. To introduce a virus into any substance.
Insidious. Deceitful; lurking.

Lacerated. Torn.
Lubricate. To make smooth.

Maceration. The softening of a substance by soaking in a liquid.

Medium. An agency of transmission or communication; surroundings; any substance in which bacteria are grown.

Mobility. Capable of being moved.

Molecule. The smallest part of a compound that can exist and maintain its chemical features.

Moribund. In a dying state.

Mucous Membrane. The thin layer of tissue lining the canals and cavities of the body that communicate with the external air.

Nerve Centers. A mass of nerve cells that control or help to control some special function, as breathing, swallowing, etc.

Nerve Reflexes. Involuntary actions, movements, or secretion induced by the stimulation of sensory nerves which transmit the stimuli to the efferent nerves and thus to the muscles or glands.

Neutralize. To render neutral, i. e., neither acid nor alkalie; to render ineffective.

Normal. Typical; healthy.

Obliterate. To wipe out.

Omnipresent. Everywhere.

Oxidation. The union of oxygen with matter.

Pallor. Paleness.

Parasite. An animal or plant that lives at the expense or is nourished by another animal or plant.

Pathogenic. Producing disease.

Pathologic. Pertaining to disease.

Periphery. The outward part or surface.

Physiologic. Pertaining to the functions of the body.

Protoplasm. The essential constituent of the living cells of body tissues.

Radical. A group of elements common to a series of allied compounds that act as a unit in a chemical reaction; extreme measures; the root or source.

Reaction. The response which a part makes to stimulation.

Reproduction. The production of offspring.

Secretion. A substance formed by secretory cells from material taken from the blood; the act of forming a secretion.

Sequela. An abnormal condition following and, either directly or indirectly, caused by a disease.

Simulated. To assume the likeness of; to pretend.

Sterile. Free from microörganisms; barren.

Stimulate. To excite or rouse.

Stimulus. Anything which is capable of producing physiologic reaction.

Symptoms. Signs.

Synthesis. Building; putting together.

Systemic. Affecting or pertaining to the whole body or a special system of the body, e. g., the respiratory system, the vascular system.

Tone. The state of the body in which all of its parts are in a normal state of tension and vigor.

Transudation. The passage of matter though a membrane or other porous substance.

Urine. The excretion of the kidneys.

Vaccination. To inoculate with a virus so as to obtain immunity from a disease.

Vacuum. A space from which all air has been removed and which contains no material substance.

Virulent. Poisonous; malignant.

Virus. Poisonous matter produced by disease and capable of propagating that disease.

Vital. Pertaining to life.

Vitiation. Impairment of a substance or process that lessens its efficiency.

Volatile. Tending to evaporate rapidly.

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